the OIL AND GAS JOURNAL
PUBLISHED WEEKLY AUGUST 1, 1960

# 4 CURRENT DEVELOPMENTS IN OIL WELL PUMPING

- Right Foundation Can Cut Costs.
- How to Weigh Dual Pumping Wells.
- Pumping Loads With Hollow Sucker Rods.
- High-Volume Pumping on Nonprorated Leases

P. 107

Phillips asks FPC:

## What must be done to justify gas prices?

p. 79

## Should oil men do business with Cuba?

p. 80

## Huge floods to make Spraberry boom again

p. 84

## Recent gains in runs don't make sense

p. 237

# How National Supply gets more stability, cuts maintenance in Universal hook blocks

With as much as 300 tons swinging and swaying on this National Universal Hook Block, its sheaves must take terrific stress. To keep the block stable, working with minimum maintenance, National Supply Co. mounts the sheaves on Timken® double row tapered roller bearings. (Diagram below shows typical mounting of Timken TNASWE bearings). Timken bearings do the job because they . . .

1) *Roll all loads, maintain alignment.* Their tapered design enables Timken bearings to take *both* radial and thrust loads, hold sheaves in accurate alignment. And because Timken bearings roll true, they roll virtually friction-free.

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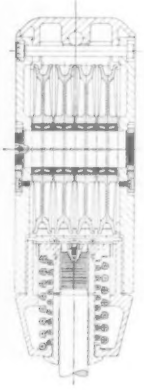

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OIL AND GAS JOURNAL
Vol. 58, No. 31

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# TECHNOLOGY—OPERATION


**Production—Special Pumping Section**

Right Foundation Can Cut Pumping Costs ..... 107

*By W. B. Bleakley*

At least four different pumping-unit supports are in use. Each has its advantages, and each its drawbacks. Local conditions are important in determining company policies. However, most operators list the wide-base unit with a gravel-and-timber foundation as their first choice.

How to Weigh Dual Pumping Wells ..... 111

*By Joe Chastain*

With two polished rods operating on about 3-in. centers, the problem of weighing a pumping well becomes a mechanical nightmare. Here are two ways to get the job done without pulling a polished rod.

Determining Pumping Loads with Hollow Sucker Rods ..... 112

*By G. R. McDannold*

Using hollow sucker rods in a dual role, as rods and tubing, means that formulas for load calculation must be changed to fit conditions. Working fluid level in the annulus, semiflowing wells, paraffin buildup, mechanical friction, and water-cut oils affect the calculations. Hollow rods should become more valuable in establishing economical production.

High-Volume Pumping Can Up Profits ..... 115

*By R. W. Parker*

High-volume pumping (rates in excess of 3,000 bbl. per day) will in some cases improve the ultimate recovery from a lease, and will thus definitely improve the financial outlook of the lease.

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*By Joseph Zaba*

The how and why of counterbalance.

**Drilling**

New Cement Additive Cuts Water Loss ..... 119

A new organic chemical, a high-molecular-weight synthetic polymer, now makes possible for the first time a low water loss in oil-well cements without harmful side effects. Small quantities of the polymer in a cement slurry can cut water loss below 50 cc. per 30 minutes.

**Refining-Processing**

Four Problems Guide Cooling-Tower Design ..... 122

*By Roy W. Maze*

Designers use these four problems as the criteria for their latest designs: (1) structural failures, (2) mechanical-equipment failures, (3) thermal-performance deficiencies, and (4) fungal attack on redwood.

Gas-Processing Plant Features Unusual Flow Scheme ..... 131

*By H. C. Bozeman*

New Texas Eastern plant at Rayne, La., uses extremely efficient refrigeration and absorption processes to recover 12,600 bbl. per day of stabilized and propane-butane condensates from 169 M.M.c.f. of wet gas.

Good Design, Layout Can Tame Hazardous Area ..... 134

*By D. G. Santini*

Union Carbide placed all reaction equipment in reinforced-concrete cells open at the top and one side and located all equipment that must be manually operated on the opposite side at its Institute, W. Va., peracetic acid plant.

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Feed composition and catalyst cost in catalytic refining—Solubility of water in hydrocarbons.

the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
August 1, 1960

Gas rates are back in the news spotlight:

Tennessee Gas Transmission is asking the FPC to grant it a 7% rate of return instead of 6% in effect since 1946. Case is being based on heavy increases in cost of borrowing.

Says TGT: Cost of debt capital has risen 64% in the last 14 years, eating into earnings rate of the company. A 6% return today is equal only to a 4.9% return in 1946.

Transwestern Pipeline is balked from moving its first gas deliveries to California because of a dispute over delivery rate.

Transwestern wants 43 cents a thousand. Pacific Lighting Gas Supply only wants to pay 42¼ cents. Dispute is now before the FPC (p. 88).*

Other gas items: Arkla has signed unusual deal to buy all the gas production of Gulf in Arkansas Valley fields of western Arkansas...Natural-gas industry will spend a record $2.2 billion this year including the first billion-dollar year for the gas-transmission segment of the business...The FPC in the Transco case before it now has best chance to say what sort of evidence a gas producer must show to support his initial price in selling to an interstate pipeline (p. 79).

▼ ▼ ▼

Union Oil will divert funds from exploration and development drilling into other channels of its operations.

Two subsidiaries slated to receive part of the funds are Collier Carbon & Chemical and Global Marine Exploration. Union says it will diversify and move into new areas because of world-wide crude surplus and changing conditions.

Development drilling likely will suffer the most. Union has drilling commitments on five blocks acquired in the Gulf of Mexico in February and must start a wildcat in the Spanish Sahara this fall.

Best strike yet in Sublette County portion of Wyoming's Green River basin is the Smith 2 Mikelson Creek Unit. It

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*Refers to article in this issue giving more details. Where no page is given, the item is a Newsletter exclusive.

was completed flowing 360 bbl. daily on 32/64-in. choke from Mesaverde perforations at 3,536-49 ft. The wildcat is 14 miles northwest of Big Piney field.

Utah's newsmaking Lisbon field may have a new producing horizon—the Pennsylvanian. Pure Oil reports oil recovery from that zone at its 2 Northwest Lisbon-C, north extension to production. The field has Mississippian gas and oil production and Devonian oil production.

▼ ▼ ▼

Sinclair and Texaco have good Colombian strikes. The Sinclair wildcat is in middle Magdelena Valley on a 215,060-sq.-mile concession held jointly with International Petroleum. It was completed as a dual producer. The Texaco discovery, also a dual producer, is in the Llanos foothills (p. 104).

Pure is showing an interest in Alaska. A few weeks ago its chief geologist, John Maher, visted Anchorage; and in a most recent state lease sale the company successfully bid on 6,491 acres. Now look for the firm to open Anchorage office.

Alaskan prospects also have lured Sinclair and British Petroleum into earning an interest in the Yakutat venture already involving Colorado Oil & Gas, Frankfort, Conoco.

▼ ▼ ▼

The Arab world is trying to close its own ranks and join forces with Latin American oil countries before the October meeting of the second Arab Oil Congress in Beirut.

Mohammed Salman, director of the Arab League's petroleum department, landed in Caracas last week for a 3-week visit with Venezuelan leaders. The Latin American trip follows closely his visits to Iraq, Kuwait, and Lebanon.

Salman says both Kuwait and Iran are committed to sign an agreement for "coordination of Arab oil policy" before the October meeting. Saudi Arabia and Jordan have signed.

A showdown nears between Iraq Petroleum and the Basra Port Authority over a new loading fee the agency arbitrarily has imposed. The new levy is 79 cents a ton of 10 cents per barrel for tankers—10 times the former fee (p. 99).

Oil not diplomacy is back of Egyptian President Nasser's blast at the Shah of Iran and the diplomatic break between the two Moslem countries.

Iran ordered the United Arab Republic's ambassador to leave the country after Nasser attacked the Shah for recognizing Israel. Actually Israel has enjoyed de facto recognition in Iran for 10 years.

Real reason behind the rupture is the opening next week

of Israel's new 16-in. crude pipeline from Elath on the Red Sea to Haifa on the Mediterranean. The pipeline bypasses the Suez Canal and will give Israel an exportable surplus of oil. The oil will come from Iran as it has for several years.

India is pressuring its oil suppliers for more price cuts.
The government is seeking cuts on product prices that will match low-cost prices offered by Russia. It also is asking lower crude prices than those already offered by two major marketers (p. 99).

▼ ▼ ▼

First large computer-controlled gasoline blending system will go into operation in early September at the Los Angeles refinery of Wilshire Oil Co.
Amounts of stocks and additives fed to the in-line blender will be accurately controlled in accordance with blend instructions supplied to the computer.

An oil pinch may be waiting around the corner in Cuba after all unless Russia steps up deliveries of crude.
No talk yet of belt tightening on the island but the rate of tanker arrivals from the Black Sea is meeting less than half Cuba's normal demand. Product stocks must be declining.

Crude produced on the Venezuelan side of the Gulf of Paria will be refined—for the time being—in Trinidad.
Test production from Paria Operation's wells in the gulf will be allowed to go to Texaco Trinidad's big refinery instead of making the much longer haul to Venezuelan plants.
But in granting the permission, the Venezuelan government emphasized it was only for a limited amount of crude.

▼ ▼ ▼

Rebellion against giving trading stamps to customers is snowballing among California service-station operators.
More than 3,000 operators have dropped the stamps to cut expenses and save thin profit margins. An estimated 16,000 California stations give the stamps.

Two views of the gasoline market:
Demand is expected to be running 3.5% higher by year end than in 1959—this despite a slow start at beginning of the year, according to Du Pont forecast.
Pleasure boating is expected to use 533 million gallons of gasoline this year, up 9% over 1959 and 61% over 1956. About 40 million boaters will spend $2.5 billion this year on recreational boating.

Travel accident insurance policy providing $25,000 for accidental death for $10 semiannual premium is offered its credit-card customers by Indiana Standard.

# Market Memo

August 1, 1960

Prices are up one-quarter cent per gallon on all grades of gasoline on the Gulf Coast.

The price advance was a squeeze play. One-quarter cent above the posted 10.75 cents was paid for 55,000 bbl. of 90-RON gasoline needed to complete loading of a supertanker.

Result was a one-fourth cent advance in posted prices for 87 through 93-RON gasoline on July 26—and the next day the premium grades, 95 through 100 RON, advanced too.

The Gulf Coast price rally was a seventh-inning affair, taken with complete disregard for gasoline inventories and crude runs to stills.

Price recovery could become price relapse if refiners continue to break all summer records in crude runs—and that has been the case for the last 4 weeks. Never before have so many barrels of products been produced for so few barrels of increased demand.

Crude stocks are low—which means if refiners persist in holding runs up, they could trigger an increase in crude production not warranted by demand.

Gulf Coast prices currently are firm, though the new posted prices for gasoline have not been tested...No. 2 is firm at its posted 8.25 cents, with prospects good for a price increase...Bunker C fuel is firm at posted $2.30 per barrel, and low-sulfur Bunker C is tight at posted $2.55.

Mid-Mississippi River markets are quiet. Just how much of the Gulf Coast gasoline price advance the river markets will stand remains to be seen...A range of Gulf Coast low to one-quarter cent over that figure prevailed on the river in midweek.

Chicago gasoline prices must advance at tank-wagon levels to reflect the one-half cent posted-price increases of July 18 before any additional price improvement at refinery level can be expected.

Chicago middle-distillates are priced at respective lows of 9.75 cents for No. 1 and 9 cents for No. 2. Price increases are hopefully discussed.

Group 3 gasoline for northern shipment is holding its own but rumors of discounts are more frequently heard than early in the month.

The price increase of one-half cent effective July 20 on No. 1 and No. 2 at the posted level continues firm with No. 1 at 9.5 cents and No. 2 at 8.5 cents.

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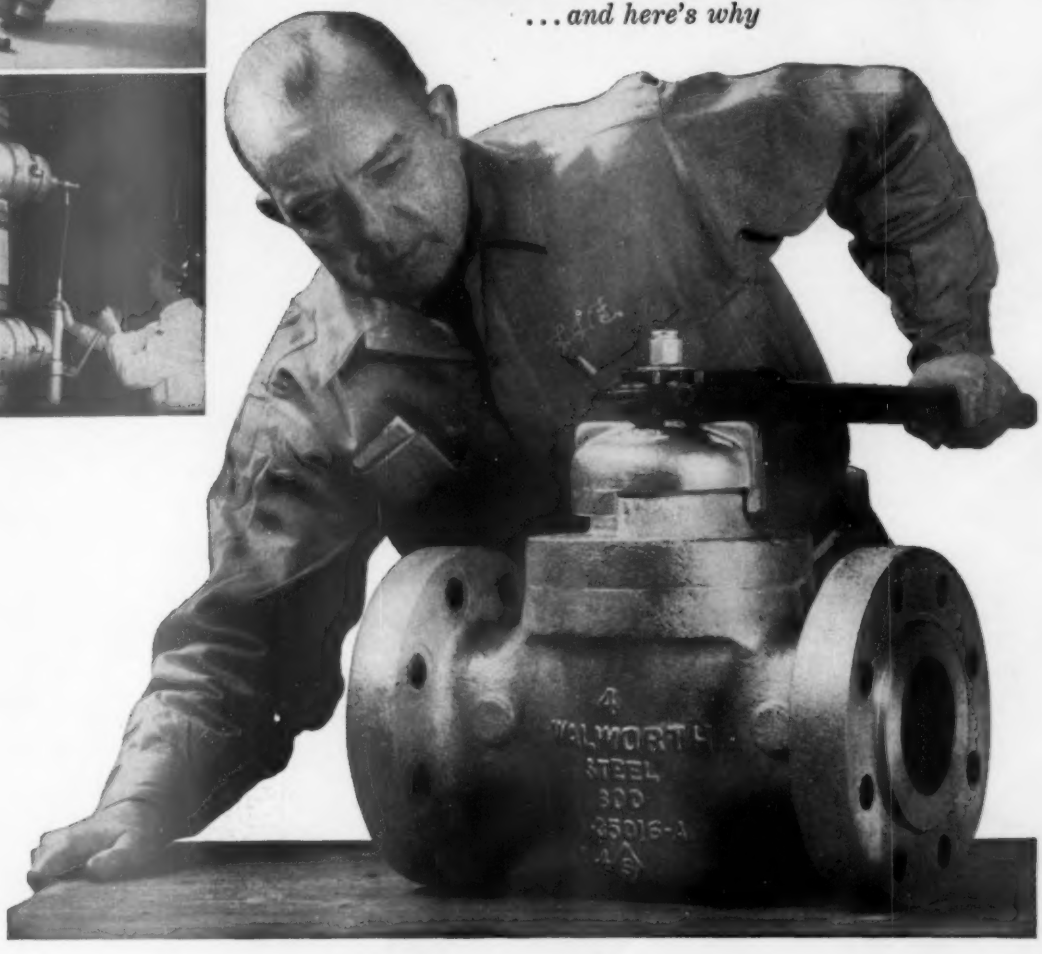


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Grade "Y" Rods are your best buy for deep wells (non-corrosive or inhibited) where a wide range of repeated stress is encountered. They can be ordered with standard or slim-hole Grade "S" or CO-HARD couplings. Talk it over with your "Oilwell" representative and make your own test by running a string in your next well.

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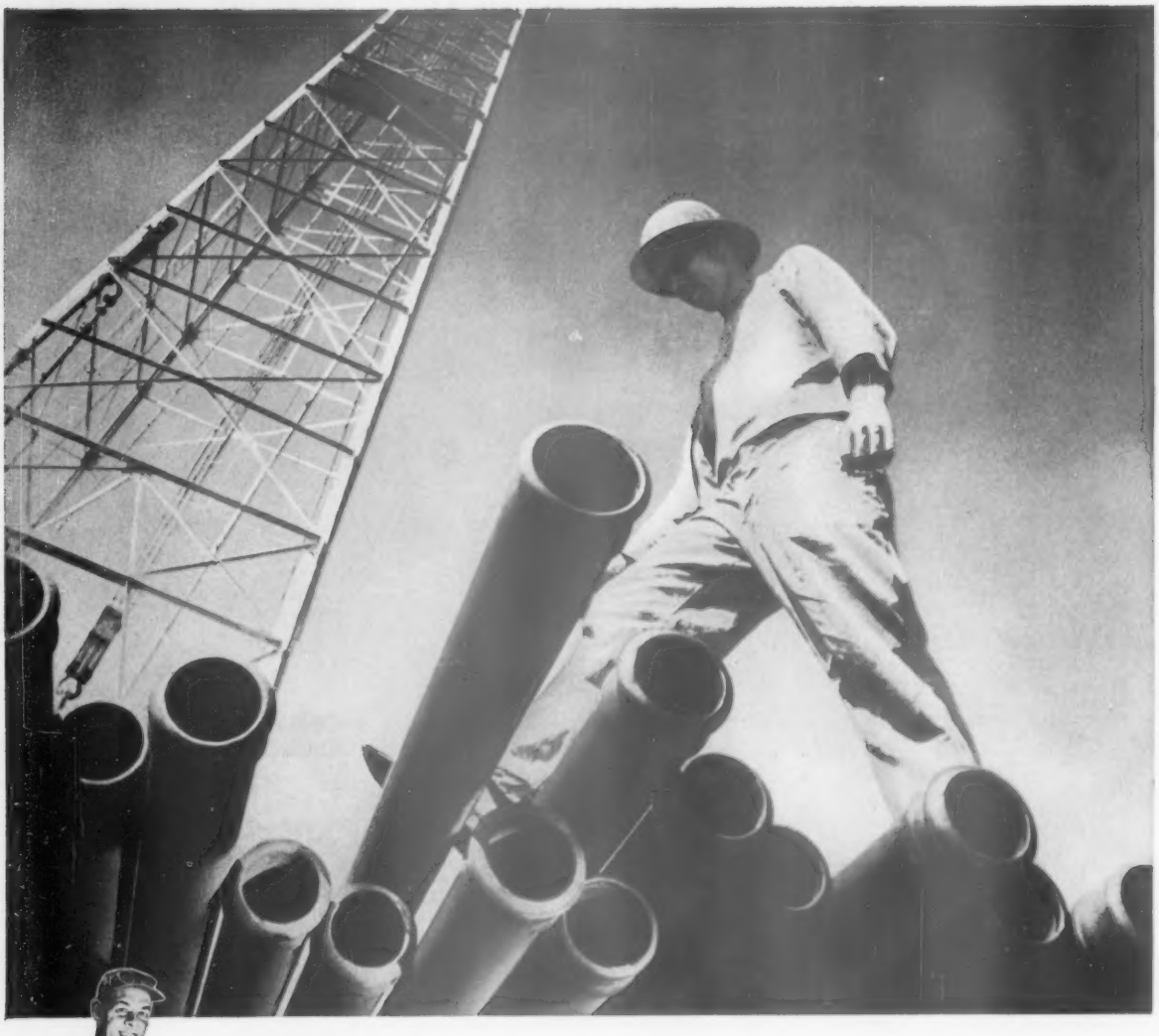

*What's behind the demand for*

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# An assignment in migrating ions... for Lukens Application Research.

Corrosion. This is the metallurgical result of ion migration. It's a frequent opponent for the Lukens Application Engineer in his job of helping you determine the *best* steel for "problem" applications. In the case of miscellaneous-cargo tankers, for instance, corrosive hot caustics are often carried on one leg of a trip; on another... high purity glycerine that must not become contaminated. How, marine designers asked, can we get *economical* protection both for cargoes and hold tanks? Drawing on years of experience with process industries equipment, Lukens Application Research suggested the answer: nickel-clad steel—highly corrosion-resistant, comparatively inexpensive—with a special sodium hydride finish that is easy to clean, expedites conversion.

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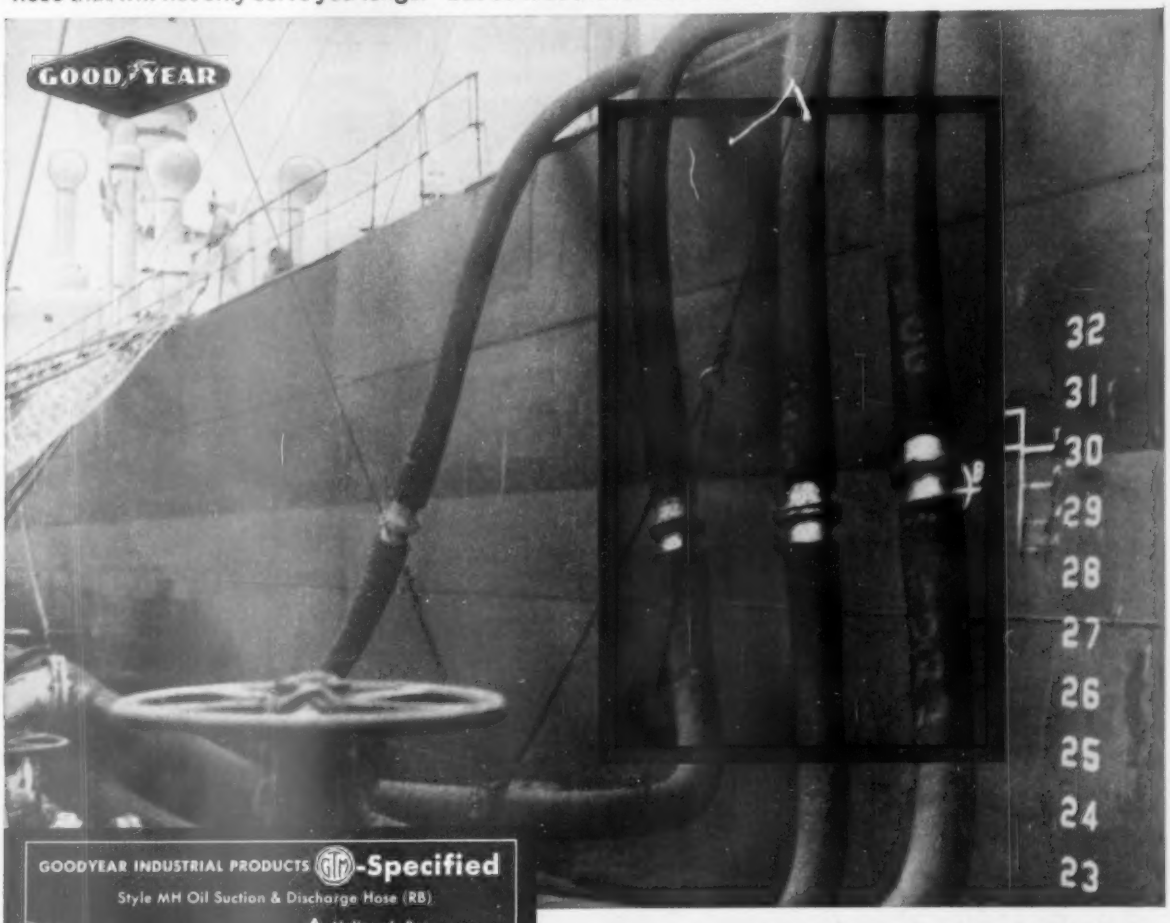
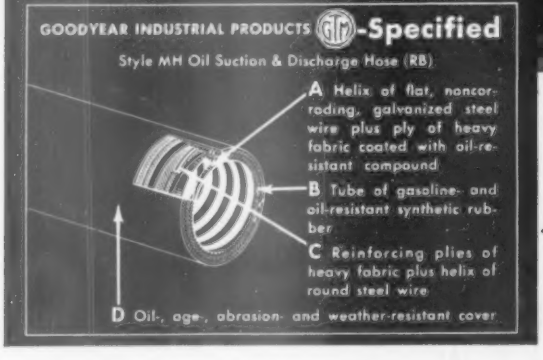
**Here's hose designed for the toughest oil-handling jobs** at docks and refineries. It's MH Oil Suction and Discharge Hose developed by the G.T.M. – Goodyear Technical Man – and his colleagues. And it's built with a tube of oil-resisting synthetic rubber to carry millions of gallons of oil, gasoline, solvents–even butane. The tough, abrasion-resistant cover can withstand constant dragging back and forth over rough piers and sharp ships' plates. Multiple helices of heavy steel wire guard it against kinking or crushing–multiple plies of heavy fabric armor it against abuse. Here, then, you have an oil-handling hose that will not only serve you longer–but do it at the lowest over-all cost.

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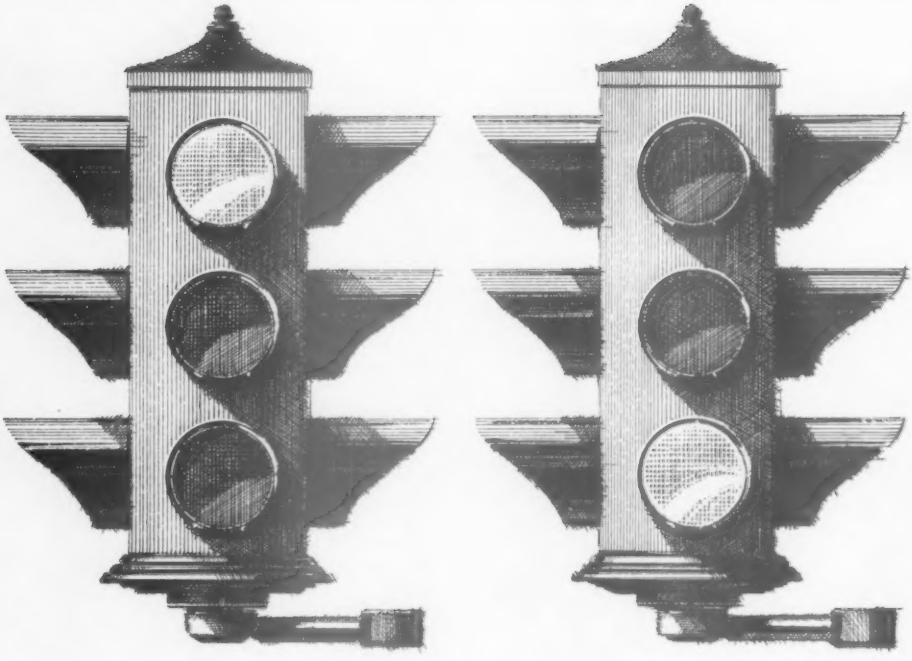
## *Which light is green?*



# Can you tell the real thing when you see it?

Pay attention to position. It's often important.

Take the question of caustic shipment. If you are situated on or near a navigable waterway . . . perhaps you should be receiving caustic by barge. It's low-cost transportation, and our studies reveal that a great many caustic users who should be taking advantage of it aren't doing so. May we help you pinpoint your position? We produce caustic at Geismar, Louisiana and Wyandotte, Michigan . . . ship it from either plant by barge or ocean tanker, truck or tank car. We know which should go where, and would like to put this knowledge to work for you. Call on us.

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**ANSWER:** You can be pretty sure that the bottom light is green. Most are . . . but don't bet your life on it!

* * * * *

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# sharp

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# sensitive

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American Bi-Metal Thermometers are made of weather-proof stainless steel. All joints are welded to solid unity, then polished smooth so corrosion won't build up and destroy the thermometer's usefulness. And, you don't have to discard this thermometer even if the glass is ever broken. The bayonet lock bezel makes replacement easy.

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Again last year, over a fourth of all the workmen's compensation insurance bought by Texas employers was bought from TEIA ... far more than from any other company. What better proof of the preference for TEIA's protection.

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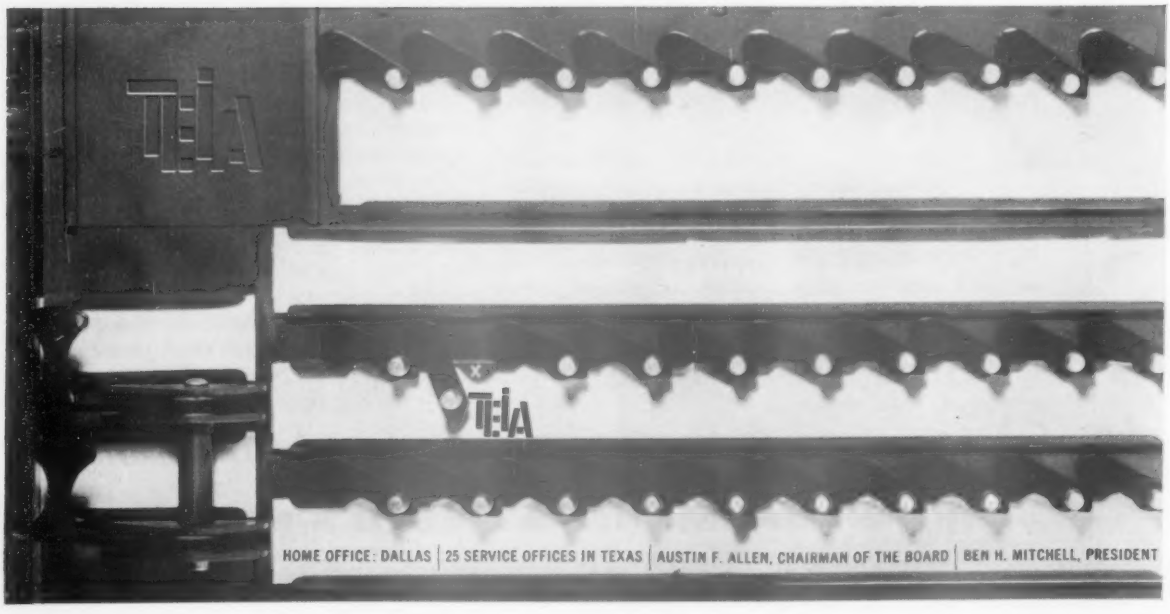
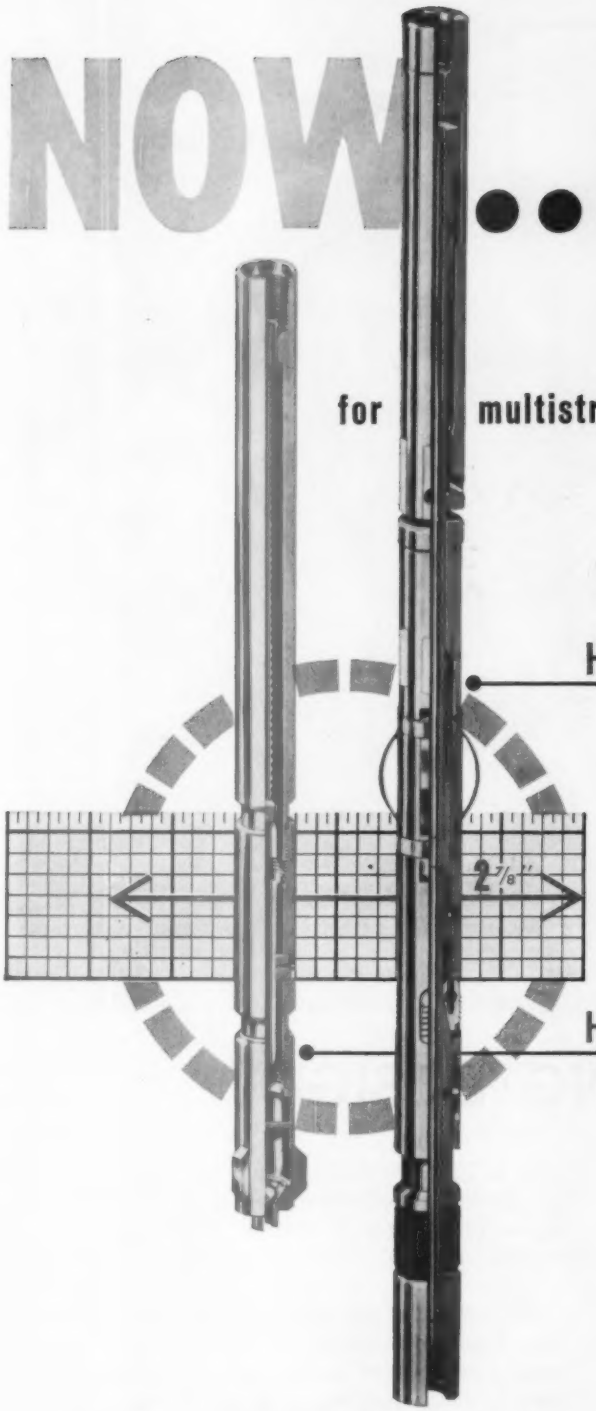
# PREFERRED



# NOW... FULL SCALE TOOLS

## for multistring and tubingless completions




Having the special tool you need *ready when you need it* is an important practice at Halliburton. Look at these new developments and SEE THE MANY JOBS YOU CAN DO DOWN 2⅞" O.D. TUBING!

### HALLIBURTON TENSION PACKER

***for 2⅞" tubing***

Here is a multipurpose packer with all the features usually found only in larger sizes. Equipped with the circulating valve shown, you can perform treating or squeezing operations through this retrievable packer. Without the valve, the tool may be used as a production packer. The packer is set by turning and pulling upward on the macaroni tubing string on which the tool is run. Tension setting eliminates possible damage from setting down weight to set the packer . . . and there's no need for an auxiliary hold down.

### HALLIBURTON HYDRA-JET

***for 2⅞" tubing***

Now you can hydraulically cut or perforate . . . and even initiate fractures from within 2⅞" tubing with this small size version of the popular Halliburton Hydra-Jet tool.

Other special tools available now from Halliburton for use inside 2⅞" tubing include • Collar Locator and • Dump Bailer. The list is growing almost every day with such tools as the Halliburton R-3 Treating Packer, Retrievable Test-Treat-Squeeze (RTTS) Packer, and Retrievable Bridge Plug.

Check with your Halliburton Representative for the very latest developments.

**HALLIBURTON SPECIAL TOOLS SERVICES**

HALLIBURTON COMPANY — DUNCAN, OKLAHOMA

***Continue to look to Halliburton . . . for Leadership***

*Another Step In Gray Quality Control . . .*

# ENGINEERING DESIGN

From drawing board to well head installation, good, basic engineering design is built into every Gray Well Head Control Assembly component. Gray's Engineering standards require practical application of such engineering precepts as more strength, less weight; reduction of areas subject to pressure; elimination of unnecessary parts. Gray has done this, and combined it with flexibility to efficiently handle every well control problem in whatever pay zone you are working — deep or shallow, single or multiple.

For additional information about why Gray Engineering Design is another step forward in advanced quality control, write today for your copy of the new Gray Catalog.

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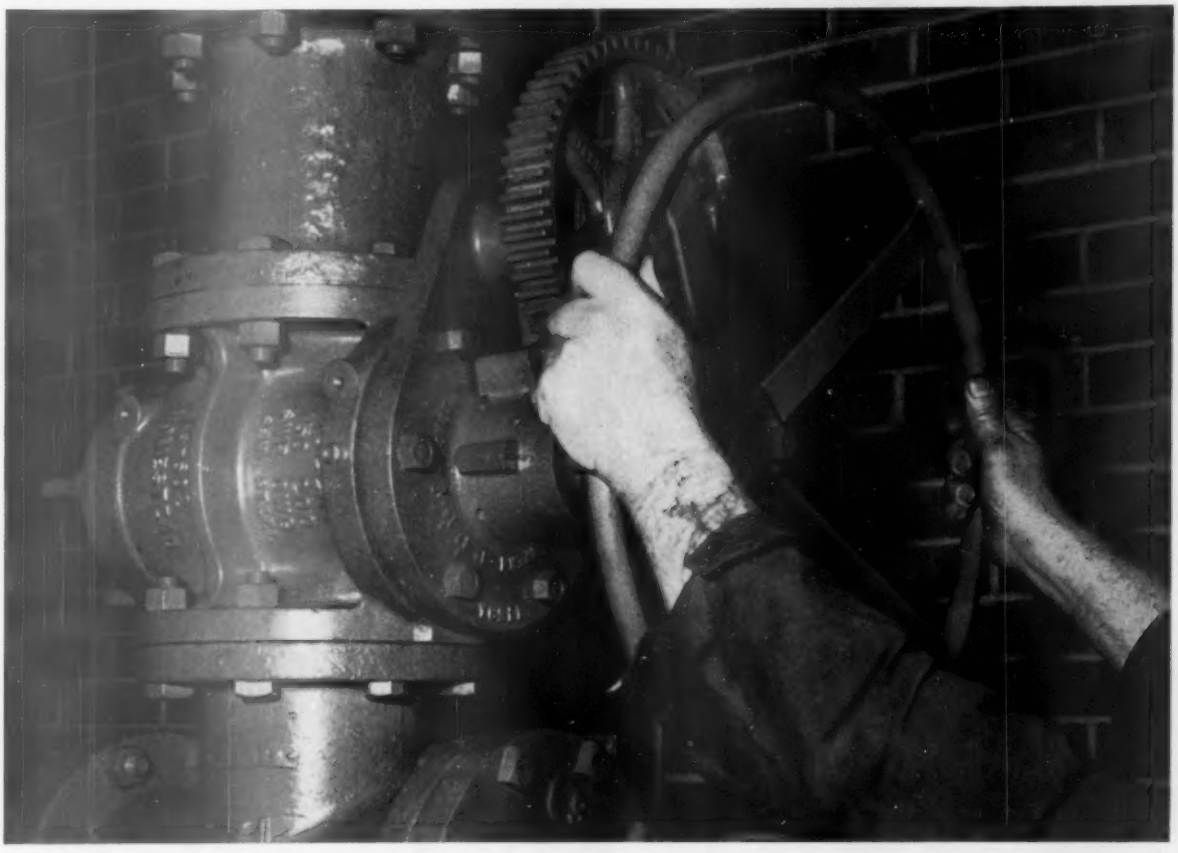
with Homestead Lubricated Plug Valves. When open, they provide full pipe-sized passage to fluids. Closed, their controlled high pressure lubricant



system, plus extremely close plug and body tolerance, guarantee a complete chemical seal—positive shut-off without contamination of line fluids. Instant response is sure, too, because piston-like movement of plug during each lubrication prevents sticking. They are low in first cost—low in upkeep. Write for complete details.

hv

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Gentlemen: Please send me Catalog 39-1 and prices on Homestead Lubricated Plug Valves 406

Name.....Title.....

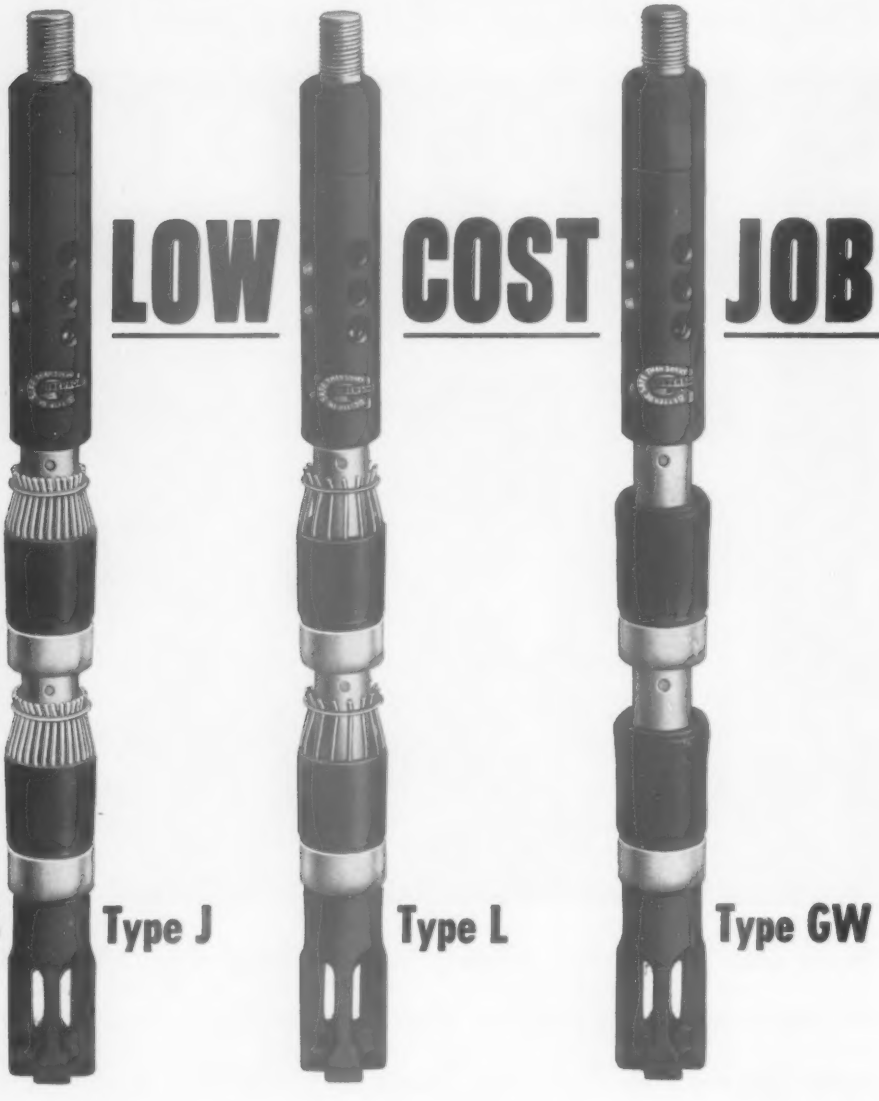
Company.....

Address.....

City.....Zone.....State.....

# GUIBERSON SWABS DO A

# GOOD LOW COST JOB!



**GUIBERSON'S** Type J Type L Type GW

Here are three swabs capable of swabbing all sizes of tubing and drill pipe — in a minimum of time — making them most economical and efficient for routine swabbing. Many other types of Guiberson cups are immediately available for *specific* and *unusual* swabbing problems.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# Trinity
# LITE-WATE

## A Complete Low Density Cement that is

# HIGHLY IMPERMEABLE

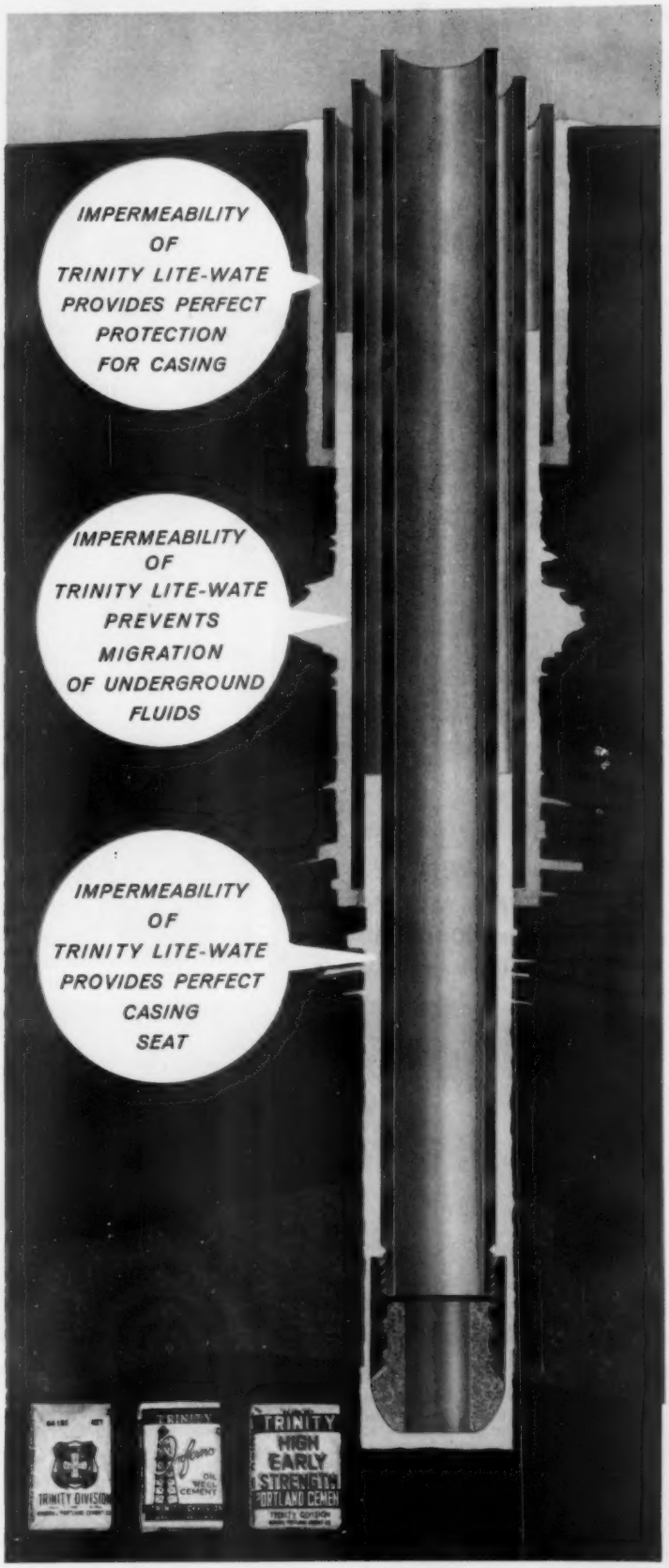
**Trinity Lite-Wate fulfills all important functions when placed in an oil or gas well.**

### PERMEABILITY TEST DATA

All slurries were prepared according to procedures of API RP IOB and cured at 140°F and atmospheric pressure for 72 hours.

| Percent Mixing Water | Slurry Wt. Pounds Per Gallon | Permeability Millidarcys* |
|---|---|---|
| 65 | 13.66 | 0.001 |
| 75 | 13.18 | 0.001 |
| 85 | 12.77 | 0.001 |
| 95 | 12.44 | 0.001 |
| 105 | 12.14 | 0.002 |
| 115 | 11.89 | 0.003 |

*A darcy is that measurement of permeability that will permit a liquid having a viscosity of one centipoise to flow at the rate of one milliliter per second through a specimen one centimeter in length and having a cross section of one square centimeter under a pressure difference of one atmosphere. A millidarcy is 0.001 darcy. The permeability of Trinity Lite-Wate cement is expressed in millidarcys.


IMPERMEABILITY OF TRINITY LITE-WATE PROVIDES PERFECT PROTECTION FOR CASING
IMPERMEABILITY OF TRINITY LITE-WATE PREVENTS MIGRATION OF UNDERGROUND FLUIDS
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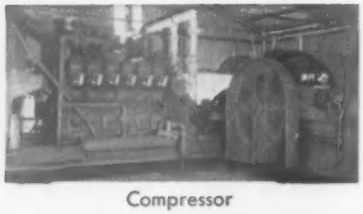
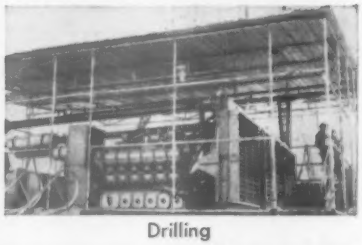


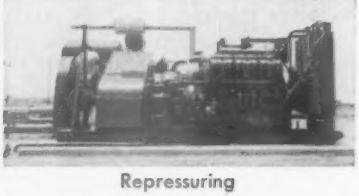
Compressor



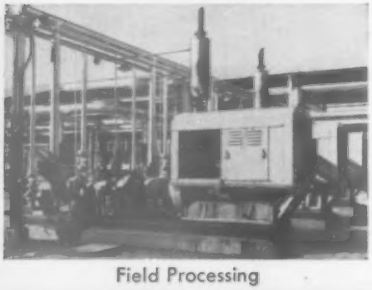
Drilling

Generator Drive

Pipe Line

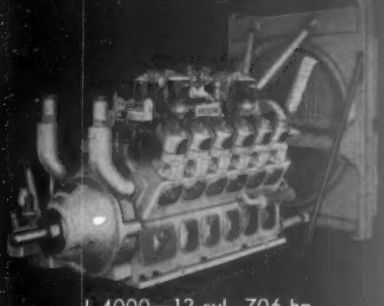


Repressuring



Field Processing

Transport



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DU PONT *Petroleum Chemicals* NEWS

Number 103 in a series of bulletins for the Petroleum Industry

AUGUST 1960

# Du Pont reports on the progress of linear programming

**HERBERT O. BAILEY and JACK S. BELLAH,** refinery technologists, discuss the programming of a customer's refinery operation.

The purpose of the Du Pont linear programming service is to help refiners look at *both* the forest and the trees – to analyze the economic effect of every processing and blending phase, and from this analysis obtain an over-all view of the economy of a particular refinery's operation.

In one instance, linear programming showed how a company was losing over $1 per barrel by diverting one component to a less profitable alternate use.

In another case, a company learned that it was buying a component at a price considerably above its actual value to them.

Du Pont has now expanded the scope and capabilities of its linear programming service. The past and the future of this service are explored in the statements on this page by Jack S. Bellah and Herbert O. Bailey, Du Pont refinery technologists.

## Linear programming up to now by Jack S. Bellah

"In the past two years the many customers who have utilized our linear programming service have found it to be a useful adjunct to their over-all refinery operations and planning.

"On occasion, the analyses they received opened the door for changes which could effect appreciable economies. In other instances, results have verified that the *modus operandi* of the refiner was already at the optimum.

"Du Pont instituted this service with two purposes in mind:

"First, as a study of a customer's actual operations – to develop the over-all economic picture of his gasoline blending operations, putting all factors into their proper economic perspective when maximizing profit. From this, much information can be readily developed on the effect of varying elements of the system.

"Second, where the customer is interested in linear programming as a permanent tool in his own economic studies, a trial run by Du Pont can give him experience on which to base his own choice of programming system. In some cases, Du Pont has helped to train those persons who will make the actual studies, and has continued to suggest ways in which the studies can be broadened into more comprehensive and useful management tools."

## The future for linear programming

by Herbert O. Bailey

"We expect to expand the Du Pont linear programming service by introducing more customers to it and by exchanging ideas, concepts and methods with those who have already started using it.

"One new approach is our use of the IBM 704 computer. The larger memory capacity of this machine helps us assist our customers in studying larger and more complex problems, including: maximizing the profit on numerous grades of gasoline; interseasonal storage of gasoline and heating oil components; complete refinery simulation from crude to finished products.

"On the 704 we can, within reasonable limits, incorporate in a single problem the combination of variables that determines:

a) Selection of crude slates.

b) Determination of reforming severity level and tetraethyl lead concentration for minimum cost research and motor octane numbers.

c) Choice of catalytic cracking plant feed stocks.

d) Disposition of butanes among motor gasoline, alkylation or polymerization plant feed stock.

e) Component and finished product production within process capacity limitations, and with all finished products meeting specifications.

f) Size of profitable marketing areas."

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

# DUPONT *Petroleum Chemicals* NEWS

***ATTENTION MARKETERS:***

## New survey probing motorist buying habits soon to be released

Now in the final stages of compilation is the 1960 DuPont survey, "Profile of the Motorist". This is the fourth in a series that constitutes the largest such study ever undertaken in the petroleum industry.

Coast-to-coast interviews (4,500) are shedding new light on old questions, such as: gasoline brand preference, loyalty to service stations, the effect of price wars on buying habits, regular-vs-premium grades, and non-petroleum purchases at service stations.

Other areas of particular interest include: the growing use of non-oil company credit cards, vacation use of automobiles, the effect of trading stamps and activities that compete with driving (such as home swimming pools, daytime television).

This study is another example of the marketing services available to DuPont customers. Results will be available this fall.

## Du Pont study shows fewer gasolines cause carburetor icing

Results are now available to marketers and refiners from the *Winter, 1960*, DuPont Survey of Carburetor Icing.

30 regular grade gasolines, 30 premiums, and 4 super premiums were investigated. Samples were obtained from service stations in various marketing areas, with particular emphasis on regions where carburetor icing has been most prevalent.

Contrasted with results of the 1959 survey, it appears that there was a general decrease in the tendency of motor gasolines to cause carburetor icing:

47% of *regular* gasolines were satisfactory, compared with 35% in 1959.

63% of all *premium* gasolines were satisfactory, compared with 55% in 1959.

Full information on this study – including the comparison with last year – is available from your Petroleum Chemicals Division representative.

## Western Regional Manager

**E. HEARN SIMPSON**, who recently assumed the duties of Western regional manager for DuPont's Petroleum Chemicals Division, brings more than twenty-four years of petroleum experience to his new position. He succeeds the late Robert F. Harwick.

Mr. Simpson started with DuPont in 1930 in the sales department of the "Fabrikoid" Division, Newburgh, N. Y., and two years later became a sales correspondent in the Alcohol Division of the Organic Chemicals Department in Wilmington, Del. In 1934 he became a salesman in the same division, where he was concerned with the sale of gasoline antioxidants, oil colors, and alcohol in the Middle West.

From 1943 until 1946 Mr. Simpson was a supply officer in the U. S. Navy. He returned to DuPont in 1946 as sales manager of the alcohol and camphor section, Petroleum Chemicals Division, and a year later was named assistant sales manager of petroleum additives. In 1950 he was appointed manager in charge of industrial sales for the Petroleum Chemicals Division and the following year was named acting manager of the Eastern Region with headquarters in New York City. In 1952, Mr. Simpson returned to Wilmington as manager of sales of the Petroleum Chemicals Division, a post which has now been discontinued.

A native of Washington, D. C., Mr. Simpson attended public schools in Delaware, Oklahoma, and Colorado, and joined DuPont following graduation from the University of Denver with a bachelor of science degree in 1930. He is a member of the American Petroleum Institute.

## New Du Pont yellow dye is 20% stronger, more soluble

Now you can add yellow color to gasoline and other petroleum products more readily with DuPont's new Oil Yellow NB. This new dye is 15% to 20% stronger than its predecessor, Oil Yellow N.

**Use less dye.** With Oil Yellow NB you use less dye to get the same results obtained up till now with Oil Yellow N.

**Improved solubility.** Another advantage of Oil Yellow NB is its greater solubility in petroleum products. Its approximate solubility, ascertained from test samples, is 4000 mg/100 ml in a test gasoline, compared to approximately 2000 mg/100 ml for Oil Yellow N.

**Now available.** Deliveries of Oil Yellow NB are now being made from our plant at Carneys Point, N. J., and from warehouses across the United States. The dye is shipped in standard 100-lb.-net packages.

With Oil Yellow NB you can add the advantage of *faster dyeing* to that of *lower dye requirements*. For additional information and samples, contact your DuPont representative.

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## Du Pont Tetraethyl Lead and other Petroleum Additives

OVER

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A-15405

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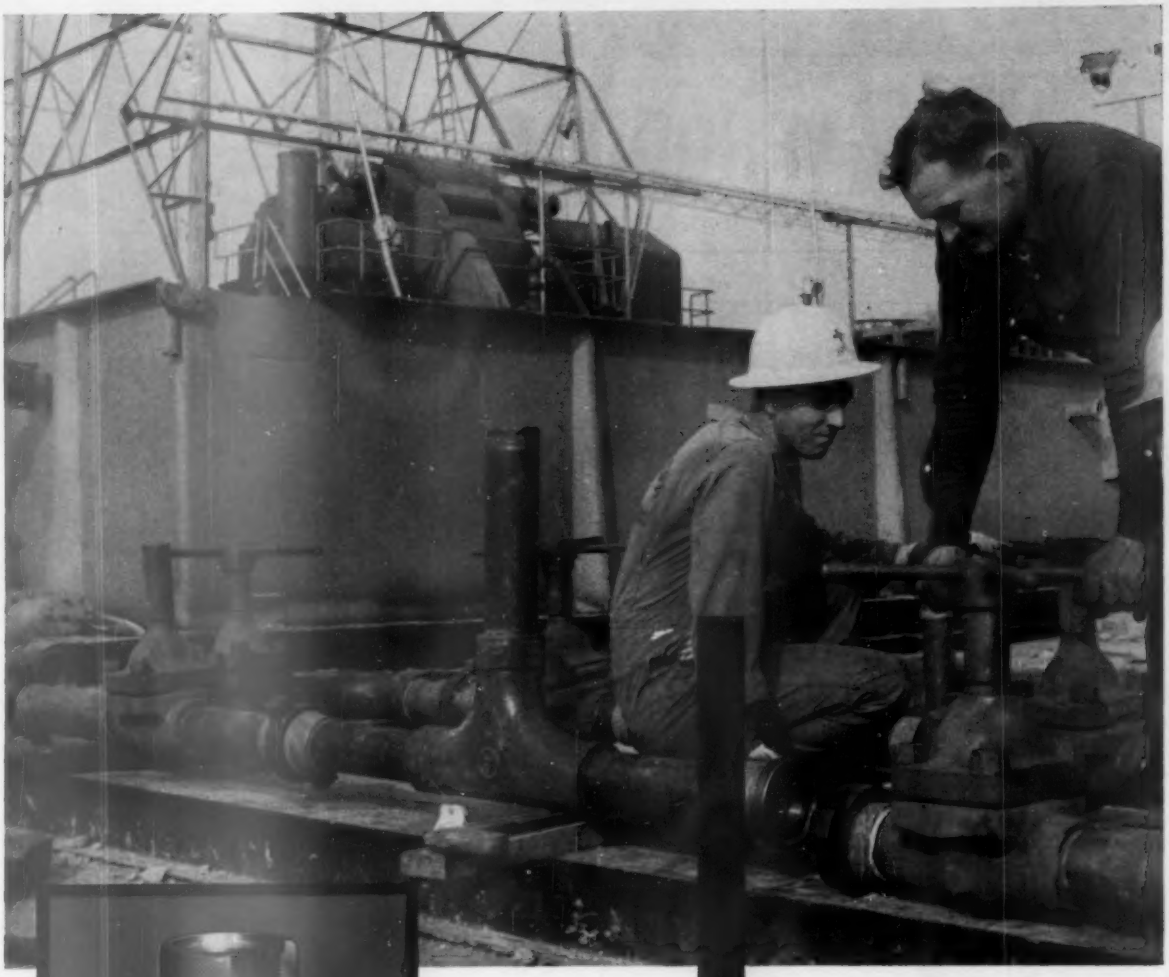

WECO Unions available in sizes 1" through 12"; pressure ratings from 1000 to 15,000 psi.

# *I'm sure glad we standardized with WECO UNIONS*

Rigging up is fast and easy, now that this rig is equipped 100% with WECO Unions. With the unions in place on pipe and fittings, it's simply a matter of laying down the pipe and making up the unions. There's no time wasted matching parts of the right unions with each other. All we do is match size and pressure, and we know they'll fit and seal because they are all WECO's. The threads start fast — draw up tight and leakproof with a couple of turns. Standardizing with WECO is the best thing that ever happened to this rig.

Complete interchangeability with perfect fit in the same size and pressure rating is the result of precision manufacture. The ball and cone seats match and mate perfectly for positive, leakproof sealing when interchanged. Acme threads on the nut are perfectly mated with corresponding threads on subs of the same size and pressure rating.

More and more contractors are standardizing with WECO Unions on their rigs. It's a money-saving move that pays off on well after well, because WECO Unions can be made-up and broken-out scores of times without damage or distortion.

WECO Unions are available in the complete range of sizes, pressure ratings and types to meet every drilling rig requirement. Ask your WECO Representative to help you plan a program of standardizing with WECO Unions.

WECO

WELL EQUIPMENT MFG. CORP.
HOUSTON, TEXAS

Division of CHIKSAN COMPANY *a subsidiary of* FOOD MACHINERY AND CHEMICAL CORPORATION

U-4-60

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WECO UNIONS

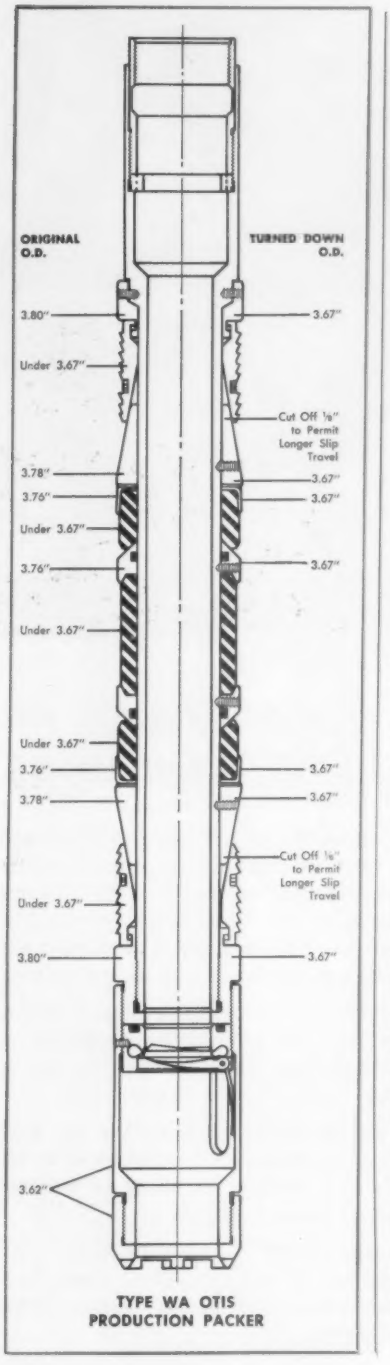
CHIKSAN SWIVEL JOINTS

HAMER LINE BLIND VALVES

HAMER PLUG VALVES

# OTIS PRODUCTION NEWS

*Volume I, Number 3* **Otis Engineering Corporation • Dallas** *Production Equipment and Services*


TYPE WA OTIS PRODUCTION PACKER

# Two Standard Model 4½" Otis Production Packers Turned Down To 3.67" O.D. And Set in 5" Drill Pipe

HOUMA, LA. – Otis packer specialists from the Belle Chasse and Houma divisions recently solved an extremely difficult well completion problem for one of the major producing companies in their area, by turning down and setting two of their standard model 4½-inch Type WA Production Packers between tool joints in stuck 5-inch drill pipe. The fact that these packers could be turned down from their normal 3.80-inches to 3.67-inches and set in 4.30-inch I.D. pipe, saved the operator a considerable amount of rig time in addition to the cost of having special packers designed and built.

Well conditions at the time the Otis specialists were called in were as follows: 12,500 feet of 5-inch, 19.50-pound drill pipe had become stuck in a salt water flow during final drilling operations and could not be freed. As a result, the pipe had been cemented in place at that depth and cut off at 2900 feet, then tied back to the surface with 7-inch, 29-pound casing. The only potential producing interval was located at 11,600 feet. Before attempting to bring in the well, the operator wanted to plug below, and set a packer above, the potential zone.

Probably the most serious problem facing the Otis specialists on this particular job was the fact that the operator wanted the packers set in the pipe between tool joints. This meant any packer run into the well would have to have an outside dimension of less than 3.75-inches to pass through the tool joints, yet have a sufficient range to set and hold in the 4.30-inch I.D. pipe. Although none of the standard production packers or bridge plugs available today are designed to cover this range, the Otis specialists felt confident their packer could be turned down and run. In the interest of time and cost, the operator agreed to try it.

After first running a 3.68-inch O.D. junk basket to 11,800 feet, the first Otis packer, equipped with an expendable sealing unit, was run in to 11,744 feet and set. In that this packer was to serve as the bridge plug, it was set 4 feet below a tool joint so that the cement to follow would straddle the joint and give a stronger plug. Running time was approximately 5¾ hours, due to the viscosity and weight of the drilling mud. Once set, three dump bailer loads of cement were placed on top of the packer and allowed to set for 12 hours. At the end of that time, the plug was tested to 3500 p.s.i. Where fluid had been lost through the bit prior to plugging, there was no bleed down of pressure.

Next, the drill pipe was perforated and squeezed below and above the intended producing interval and the zone itself perforated. With these operations completed, another turned-down Type WA Packer was run and set between tool joints at 11,570-feet. A successful test to 1500 p.s.i. convinced the operator the packer would hold and swabbing operations to bring in the well were begun.

The help given this operator by his local Otis packer and completion specialists is typical of the service available from all Otis field personnel. Their knowledge of production problems and of the application, installation, and capacity of their equipment permits them to make sound, on-the-spot recommendations. The next time you find it necessary to consult with someone regarding packers or well completion techniques, call the Otis office nearest you or write Otis, Department 3-P, Box 35206, Dallas 35, Texas. You'll find experienced Otis well completion specialists ready to help you – anxious to serve you. *© 1960 O. E. C.*


OTIS

Engineering Corporation

General Offices:

6612 Denton Drive • Dallas, Texas

# Brush-off!

## Economy size T-340 crawler clears mile per day on pipeline right-of-way!

The first job Lancaster and Ingram, Greenville, Miss., assigned their International® T-340 was a rugged test of its power and stamina. They had a contract to clear 80 miles of pipeline right-of-way heavily choked with weeds, brush, and saplings up to three inches in diameter.

Operator Arthur Hays used the IH Bullgrader® to bend over brush and trees, enabling the heavy-duty No. 26 IH rotary cutter to chop and shred everything in its path. All that was left along the cleanly-swept 80-mile swath was a mulch of chips that will help check future erosion.

Working up and down sandy clay hills, crossing creeks and sloughs, the powerful 47 hp* crawler cut a clean path 40 ft wide. It averaged a mile a day . . . eight passes with the 5-ft cutter.

**Maximum engine hp corrected to standard conditions.*

IH 7-ft hydraulic Bullgrader was used to fill eroded gullies and push fallen trees aside. Operator praises the fingertip ease of blade control and its speed of angling and tilting.

**Handle your scattered maintenance jobs** with a low-cost T-340 or its TD-340 Diesel running mate . . . a wide range of matched-to-tractor equipment fits many jobs now assigned to larger, more costly power. Ask your IH dealer for an on-the-job demonstration!

**INTERNATIONAL HARVESTER**

One good reason for buying Motorola 2-way radio . . .

# YOU CAN MAKE MORE MONEY WITH IT THAN WITHOUT IT!

Motorola 2-way radio sharpens your competitive edge with faster, more dependable customer service. Just press your microphone button—split-second radio contact beams drivers straight from job-to-job . . . makes every manhour and mile really count. You eliminate costly "backtracking" and "dead heading"—build customer satisfaction on every call. ■ Fast growing savings quickly pay your entire system costs. Then you can count on years of profit-making performance, because Motorola provides the most reliable and economical radio available . . . plus the convenience of nearby factory authorized service facilities. Start building your profits with Motorola—write today.

Motorola . . . the communications specialists for industry

**MOTOROLA** 2-WAY RADIO

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Baash-Ross and Web Wilson Tools
are sold only thru supply stores

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DIVISION OF JOY MANUFACTURING CO.

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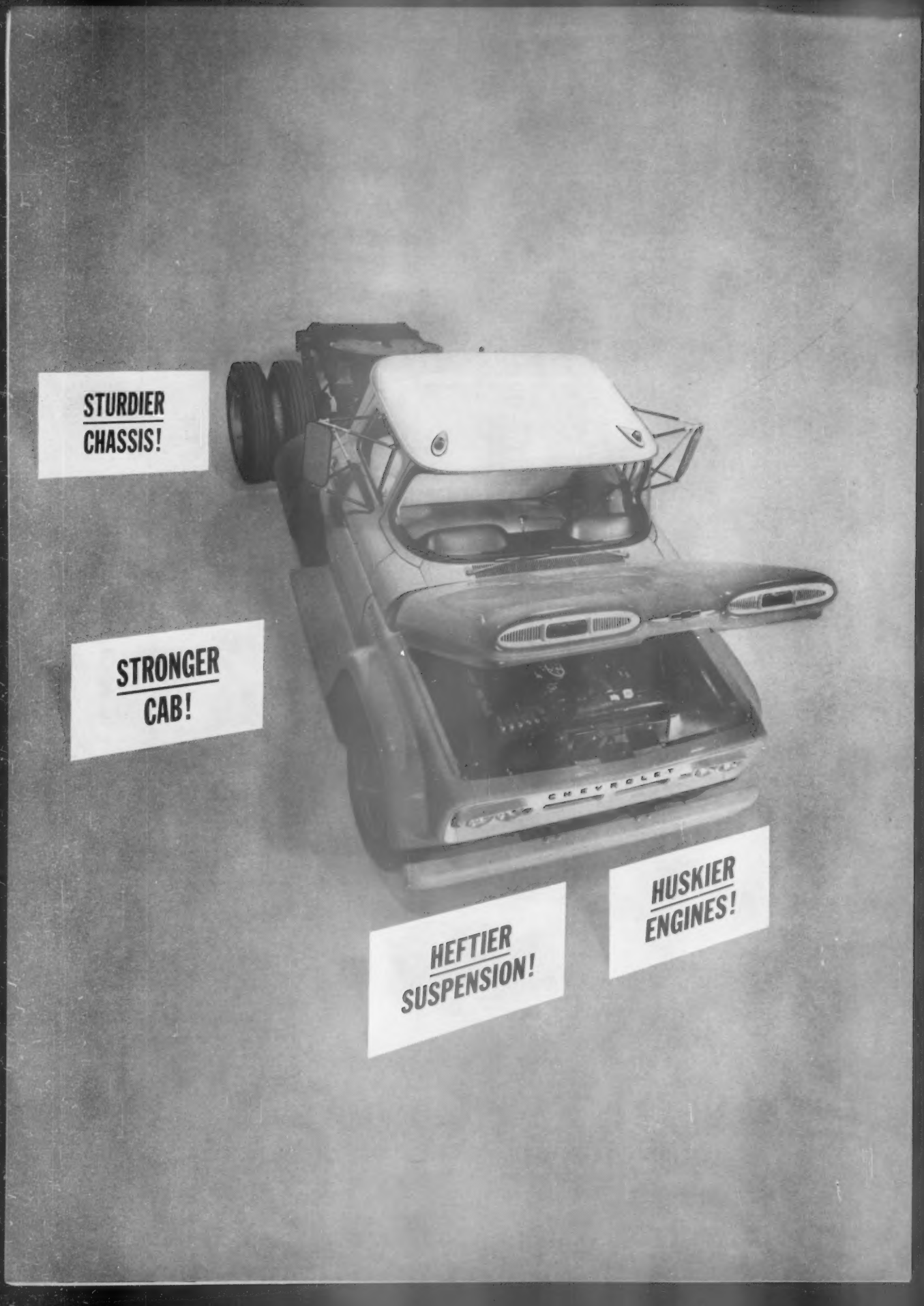

STURDIER CHASSIS!
STRONGER CAB!
HEFTIER SUSPENSION!
HUSKIER ENGINES!
CHEVROLET

# CHEVY'S PUT TOGETHER TO STAY TOGETHER... TO CLAMP DOWN ON COSTS!

**NEW STRONGER CAB CONSTRUCTION** . . . to add years to the life of your truck. Tough new steel braces reinforce cab underbody, help keep cab tight and solid, provide a sturdy foundation for long cab life. Husky new box-section pillars frame door openings; keep doors in lasting alignment. New roof panel is double walled for extra strength.

**NEW STURDIER CHASSIS COMPONENTS** . . . steel muscled truck stamina where it counts! New *frames* provide a new box-section rail design that's stronger than ever; torsional stiffness is increased up to 480%! Massive "X" or "K" brace crossmembers resist damage from frame twisting like never before. And *brakes* are bigger, for longer brake life and safer stopping. Bigger capacity *suspensions* and *axles* boost load-carrying ability.

**TRUCK-BUILT V8's AND 6's** . . . famous Chevy engines that know the most about saving money on fuel and maintenance. Brawny forged steel crankshafts assure extra endurance; long-lasting precision bearings minimize wear; full-flow oil filters protect moving parts from harmful dirt. These and many other truck-built engine features provide sure dependability that keeps your maintenance costs *down* for extra thousands of miles.

**NEW HEFTIER SUSPENSION** protects everything from wear and tear . . . and gives the ride that's revolutionized trucking. Chevy's new independent front suspension system is as *tough* as it is smooth. Rigid control arms, strong alloy steel torsion-bar springs, new low friction steering linkages are engineered to take your toughest runs with strength to spare.

Here are the strongest truck components known . . . assembled lastingly, with care and craftsmanship. It's Chevrolet's way of making sure you get maximum truck life; extra assurance of higher profits because of far fewer maintenance and repair charges.

■ When it comes to putting out a good day's work at least expense, a '60 Chevy truck knuckles under to nobody. Because, as we're showing you here, Chevrolet's building 'em *tough* these days, even tougher than ever before. And that's saying something when you consider how Chevrolet trucks have stood up over the years. Here's a typical example:

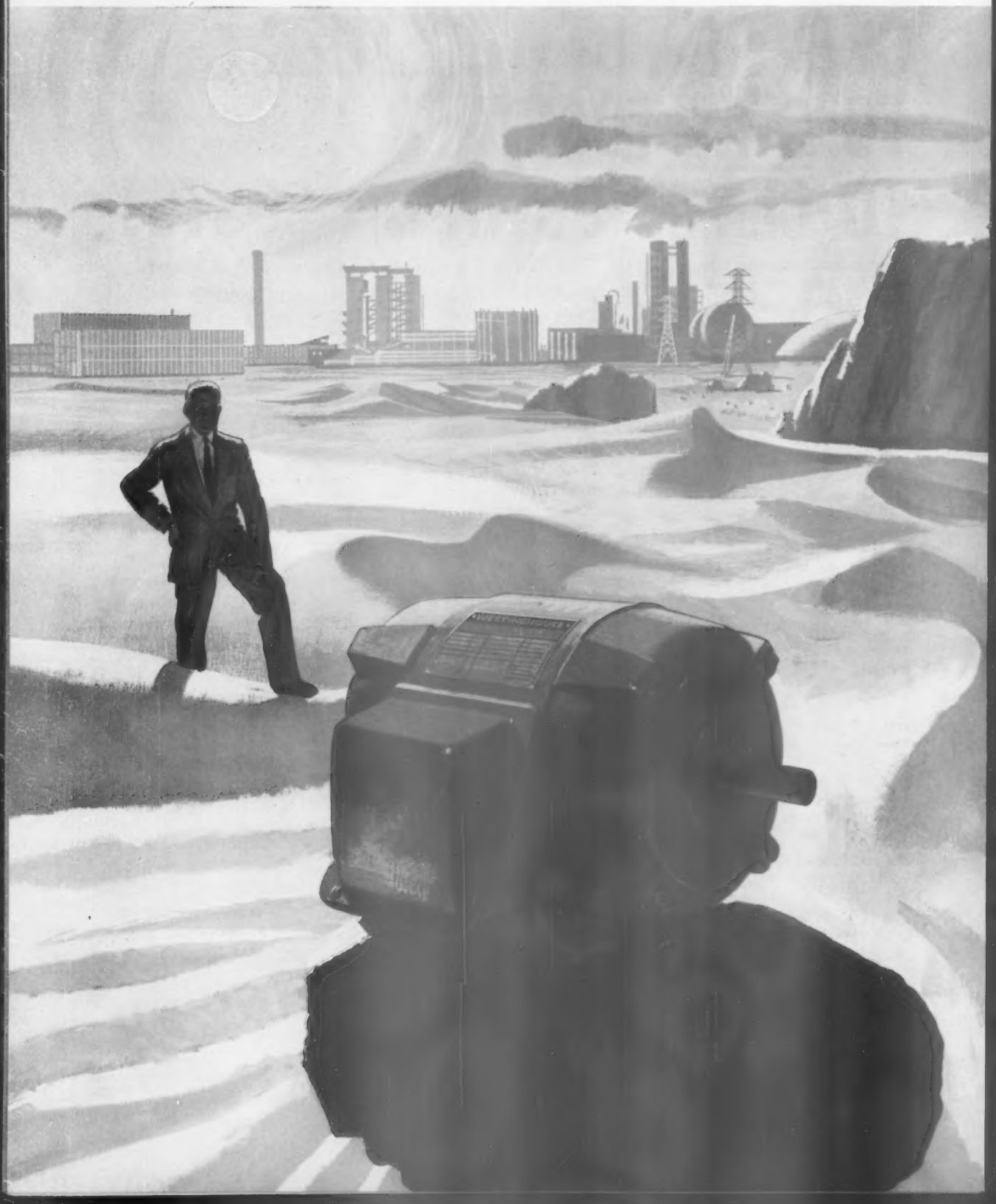
*160,000 miles on a truck-busting job—and still going strong!* The strength and stamina of this Chevy heavyweight has paid off handsomely for Emil Horwatich, Pewaukee, Wisconsin, gravel hauler. This tandem axle Chevy with Workmaster V8 has logged 160,000 miles in the toughest kind of service: hauling maximum loads about 2,200 miles a week, slogging over off-the-road terrain much of the time. "This baby just won't quit," Mr. Horwatich says. "She's a real money saver."

That kind of performance has been Chevy's stock-in-trade for years; and the '60's are designed to put out even more of it. Next time you're in the area, drop by your Chevrolet dealer's. Find out for yourself why more truckers than ever before are getting more work and earnings out of Chevrolet trucks. And make sure you *test drive* a '60 Chevy. You'll wonder how you've managed without one! . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

**1960 CHEVROLET STURDI-BILT TRUCKS** CHEVROLET

*New* Guardistor

# THE MAN & THE MOTORS



# FROM WESTINGHOUSE

## *Guardistor* motors let you match the full capability of the motor to the job— with complete safety—absolute confidence

**Our Marketing Manager says:**

- "You can match the motor to the load . . . use all the motor you are paying for.
- Provides positive protection based on winding temperature . . . *not* load current and/or power supply fluctuations.
- Eliminates time and expense of changing winter-summer heaters. No nuisance tripping, it's fail-safe . . ."

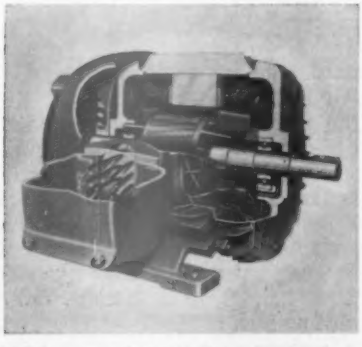
**Our Engineering Manager says:**

"With the breakthrough development of the Westinghouse Positive Temperature Coefficient thermistors, for the first time we can provide inherent protection against motor failure caused by excessive heat. The solid-state thermistors buried in the windings instantly sense excessive heat from any cause and simultaneously warn of trouble or automatically take the motor off the line. Thus, motor protection is placed where only true motor protection can be . . . in the windings."

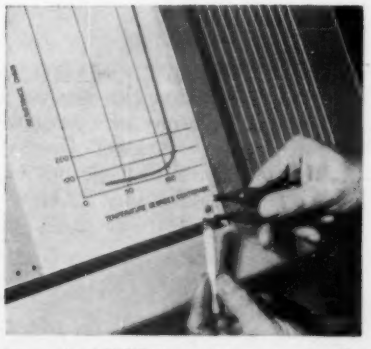
Call your Mr. Westinghouse for the application of a Guardistor* motor to your drive requirements . . . write for *Questions and Answers About . . . Guardistor* (B-7876). Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

*Trade-Mark

J-22160



Unlike remotely located sensing devices, PTC thermistors are buried in the windings of the Guardistor motor, instantly equating all temperature factors.

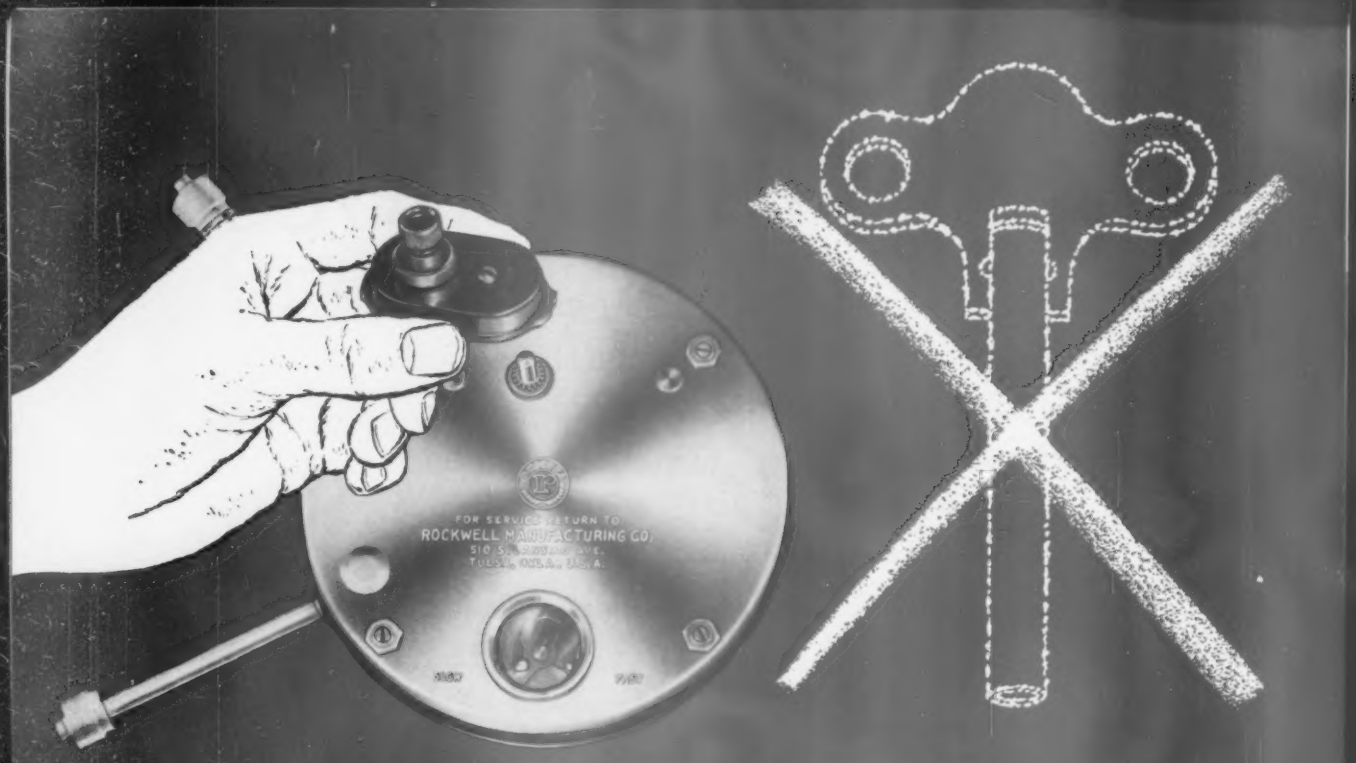


Ever alert PTC thermistors constantly totalize temperature, statically triggering an action *only* if critical temperature is reached.

MOTOR & GEARING DEPARTMENT

YOU CAN BE SURE...IF IT'S

# Westinghouse




Illustrating how speed changing turrets are applied to the chart arbor

# You never need to wind the Rockwell Gas Drive

**GAS (OR AIR) POWERS THIS NEW CHART TIMING DRIVE.** With it you can forget the costly chore of periodic winding. It's completely self-starting, self-contained. You can use the Rockwell Gas Drive with profit and gain accurate, automatic operation of recording charts on practically any make orifice meter, gas lift intermitter, pressure recorder or temperature gauge. It is particularly applicable for remotely located instruments.

Since the Rockwell Gas Drive consumes only 6 cubic feet of gas in 24 hours it is economical to use—safe, too, for there is no exhaust problem.

The Gas Drive operates on a pressure range of 15-25 psi and delivers 15 in. lbs. of torque to the main arbor which rotates once every 24 hours. Geared turrets which snap onto this arbor provide optional speeds of 2, 3, 4, 6, 12, 48 or 72 hour, 7 or 8 day rotation. So with a stock of Rockwell Gas Drives, plus a selection of economical turrets, you can serve all your instrument needs. Get facts now. Write Rockwell Manufacturing Company, Pittsburgh 8, Pa. In Canada: Rockwell Manufacturing Company of Canada, Ltd., Guelph, Ontario.

◀ Rockwell Gas Drive powers this typical intermitter

GAS DRIVES. CHART DRIVES

another fine product by

**ROCKWELL**

# A Nalco PRODUCT MANAGER

## Answers Questions About Refinery Equipment Fouling And Successful Anti-Fouling Programs

### Both Organic and Inorganic Deposits in Refinery Equipment Raise Operating Costs, Decrease Throughput

Corrosion control, desalting, oxygen scavenging, gas blanketing and adjustment of process variables will help to reduce exchanger fouling—but in many systems, fouling continues to cause trouble. Here are some of the questions that are asked, and the answers we had to find to them in order to develop anti-fouling programs of real value to refineries.

**Question:** What causes fouling in refinery systems?

**Answer:** Inorganic salts, corrosion products and organic polymers. Inorganic salts are carried into exchanger trains by water dispersed in the hydrocarbon, and deposit out as the water is vaporized on heating. Corrosion products may be carried into exchangers from other units, or corrosion may occur in the exchangers themselves. Organic polymers are insoluble, polar, high-molecular-weight materials, formed as the hydrocarbon is heated.

**Question:** Where does fouling occur?

**Answer:** Fouling may occur in virtually any part of a refinery system; however, these are the areas where fouling is usually most troublesome: heat exchangers and furnaces ahead of catalytic and thermal cracking units, reforming units, and crude units, fractionating towers, reboilers and overhead condensers. Types and amounts of deposits vary, depending on the charge stock, corrosion control measures, and process variables.

**Question:** Why is an anti-fouling program necessary?

**Answer:** Because of the high cost of processing in fouled equipment, created by: reduced heat transfer; lowered throughput; downtime; and direct cleaning costs.

**Question:** How does Nalco solve fouling problems?

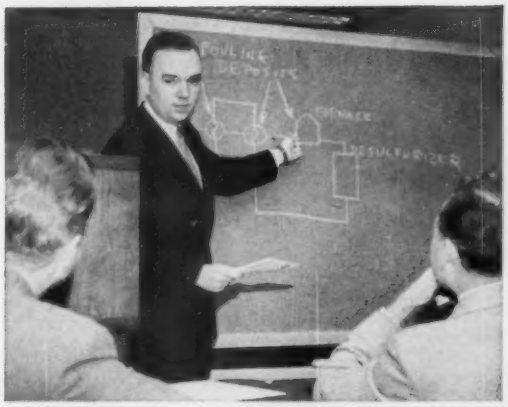
**Answer:** By making a careful analysis of the system, locating units where fouling occurs, and finding the sources of fouling. When these facts are available, recommendations are made for an anti-fouling program.

When the program is in operation, Nalco field representatives maintain close contact with operating personnel, cooperating to secure continuously successful, economical results.

**Question:** What is Nalco's anti-fouling program?

**Answer:** It is a program designed for a specific refinery system to eliminate corrosion, organic polymer formation, and any other sources of fouling. Where fouling is due to potential deposit-forming materials in charge stocks, Nalco-developed chemicals are recommended to stabilize and disperse these materials.

Usually anti-fouling additives are used in combination with Nalco corrosion control chemicals; and, where indicated, following Nalco desalting chemicals.




**R. C. Canapary, Product Manager, Petroleum Industry Chemicals Department, Nalco, is a Doctor of Chemical Engineering, whose experience includes technical and engineering work at Nalco, as well as several years with a major oil company.**

The assistance of Nalco representatives in regularly recording and evaluating the effects of temperatures, heat transfer rates, pressures, and other process variables helps to assure optimum results in operating efficiency and treatment economy.

Research and development work is a continuing part of the Nalco anti-fouling program. Nalco researchers use specially-designed equipment to simulate plant operations. Conditions can be established to accelerate fouling rates and speed development of promising new chemicals.

**Question:** How long does it take to establish the Nalco anti-fouling program?

**Answer:** A Nalco anti-fouling program can begin promptly at your request. Nalco considers a program established when anti-fouling and corrosion control results are proven satisfactory.

The electrical resistance method of corrosion evaluation, corrosion coupons, iron-in-water tests, operating records (temperature, pressure, heat transfer coefficients) and direct inspections should be used to evaluate the program's effectiveness.

**Suggestion:** Get full details on a Nalco anti-fouling program for your operation. For quick action, call your Nalco Representative, or write to me at Nalco: Dr. R. C. Canapary, Product Manager, Petroleum Industry Chemicals Department.

**NALCO CHEMICAL COMPANY**
6242 West 66th Place • Chicago 38, Illinois
*Subsidiaries in England, Italy, Mexico, Spain, Venezuela and West Germany*
*In Canada—Alchem Limited, Burlington, Ontario*

Nalco® ... Serving Industry through Practical Applied Science

Nalco CHEMICALS
Nalco SERVICES

'62 COULD BE
THE YEAR
FOR YOU!

how to make
octanes come clean . . .

Most refiners these days are called upon to make relatively high-octane motor fuel to meet current market demands. But high octanes alone are not enough. Motorists also want gasoline that burns clean!

By means of new and improved processing techniques it is now possible to produce high-octane blending components that give you the kind of gasoline motorists want. In addition to high-octane rating, these components possess excellent combustion and performance characteristics especially tailored for modern high compression ratio engines.

In order to help refiners realize their maximum potential, UOP makes available the wide variety of processes described on the opposite page. UOP technical, economic and market specialists are also available to help you determine which will best meet your existing and future needs. Ask us for a preliminary proposal, at no obligation.

INFORMED OPINION indicates that 1962 will require a substantial increase in process capacity . . . NOW is the time to start your planning!

UOP
UNIVERSAL OIL PRODUCTS COMPANY
30 Algonquin Road, Des Plaines, Illinois, U. S. A.
WHERE RESEARCH TODAY MEANS PROGRESS TOMORROW

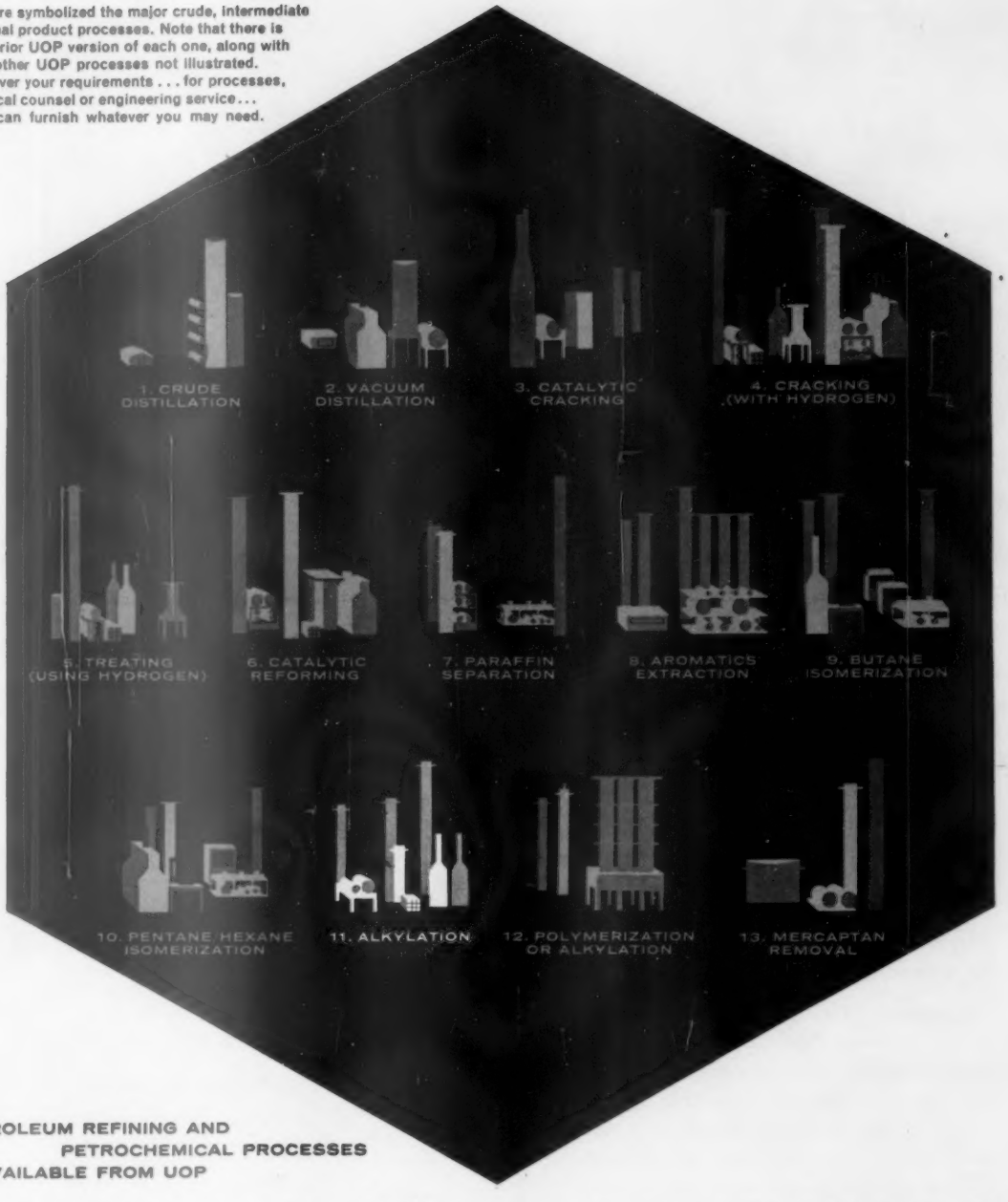
"HF" ALKYLATION

Here is a catalytic process that enables the refiner to produce an isoparaffin fuel component that burns with a minimum of carbon deposit . . . greatly reduces surface ignition and consequent rumble . . . is ideally suited to today's high compression auto engine.

Developed and licensed by UOP, "HF" Alkylation combines olefins such as propylenes, butylenes and amylenes with isoparaffin, usually isobutane. The component thus formed, alkylate, is a mixture of branch chain hydrocarbons of higher molecular weight. It is widely used in producing high octane aviation gasoline, as well as an anti-rumble component in motor fuel.

An ideal companion process to "HF" Alkylation is the UOP Butamer™ process for producing isobutane.

Here are symbolized the major crude, intermediate and final product processes. Note that there is a superior UOP version of each one, along with eight other UOP processes not illustrated. Whatever your requirements . . . for processes, technical counsel or engineering service . . . UOP can furnish whatever you may need.




## PETROLEUM REFINING AND PETROCHEMICAL PROCESSES AVAILABLE FROM UOP

1. CRUDE DISTILLATION equipment is designed and engineered by UOP in any desired capacity.

2. VACUUM DISTILLATION and VISBREAKING—easy-to-operate processes for preparation of feed stocks for catalytic cracking.

3. FLUID CATALYTIC CRACKING—an improved process that gives higher yields, higher octane numbers.

4. LOMAX™—highly flexible process that converts middle distillates and vacuum gas oils into gasolines and distillate fuels of outstanding quality.

5. UNIFINING™—a modern process that completely purifies petroleum distillates.

6. PLATFORMING® produces high octane gasolines, high purity aromatics.

7. MOLEX™—a new continuous separating process that removes lowest-grade hydrocarbons from gasoline.

8. UDEX®—the ideal process for separation of super-purity aromatics.

9. BUTAMER™—a new and practical process for producing isobutane.

10. PENEX®—a new process that converts light, normal paraffins to isoparaffins.

11. HF ALKYLATION—makes alkylate, top anti-rumble motor fuel. Sulfuric acid process also available.

12. CATALYTIC CONDENSATION—converts olefin fractions of refinery gases into high-quality gasoline and petrochemicals.

13. MEROX™—a new and inexpensive treating process to remove mercaptans from gasolines and light distillates.

**PROCESSES NOT ILLUSTRATED:**

REXFORMING®—the ideal process to insure your top octane position.

CATALYTIC DEHYDROGENATION—removes hydrogen from hydrocarbons to produce less-saturated hydrocarbons.

HYDEAL™—a new process for the hydrodealkylation of toluene or $C_9$ aromatics to produce benzene; may also be used for manufacturing phenol and naphthalene.

HYDRAR™—converts benzene to cyclohexane with excellent yields, achieves extreme high purity with Udex grade benzene.

OLEFIN EXTRACTION—efficiently separates olefins and diolefins from paraffins; prepares olefins for further conversion.

AROSORB™—removes heavier aromatics from synthetic and natural distillates, produces aromatic-free heavier distillates.

ALKAR™—produces ethylbenzene, cumene and other alkylated aromatics from Fluid Cat Cracker off-gas streams.

UNISOL®—an economical process for treating high mercaptan-containing gasolines.

This veteran Kerotest inspector is setting up a flaw-finding magnetic field between the two electrodes. He'll cover every inch of the casting — electronically seeking out minute and hidden cracks, sand holes and other potential failure points. This swing check valve body must receive his unqualified stamp of approval before it is accepted.

Magnetic particle inspection is one of more than half dozen laboratory and manufacturing quality control procedures at Kerotest. Kerotest standards of quality insure *consistent* production of trouble-free valves. A Kerotest valve in the line is your best insurance against costly down time . . . your best protection against failure in critical and hazardous applications.

**Kerotest Cast Steel Swing Check Valves**

High quality Kerotest cast steel swing check valves are available in primary service pressure ratings ranging from Series 150 to Series 1500. They are supplied in all regularly used sizes for all types of service in oil, gas, steam, water, chemical, petro-chemical, marine and industrial installations.

*Send for your free copy of the new, informative Kerotest booklet. It's packed with working tables, dimensions, specifications and other helpful information.*

**KEROTEST**
**Quality Controlled Features**

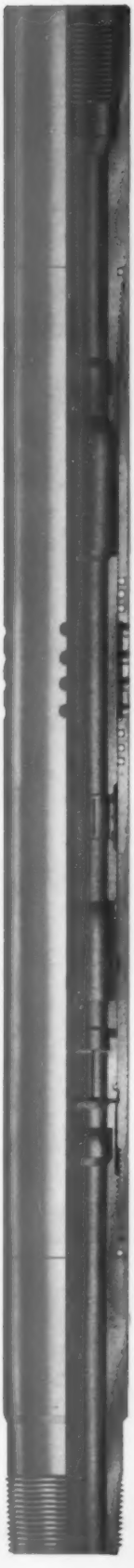
- Durable wall sections for maximum safety
- Designed to permit passage of line scraper equal to inside diameter of pipe
- Threaded bottom seating type rings made to allow full flow, obstruction-free passage
- Rigidly supported disc allows self-alignment
- Counterbalanced discs available for minimum pressure applications

**There is a Kerotest Cast Steel Valve available for every class and condition of service**

**KEROTEST MANUFACTURING COMPANY**
2582 LIBERTY AVENUE • PITTSBURGH 22, PA.

In Canada . . . Kerotest Cast Steel Valves are manufactured and distributed exclusively by Guelph Engineering Company, Guelph, Ontario, Canada

KEROTEST®



# NEW

## GARRETT COLLET-TYPE SLEEVE WITH FULL CIRCULATING CAPACITY

*Designed for optimum service, Garrett circulating valves combine maximum dependability with ease of operation. Check these important features:*

- Positive sealing under all well conditions
- O-ring type seals that cannot trap foreign material, have lip failures or cup reversals
- High test pressures, with minimum O.D. and maximum I.D.
- Positive sleeve locating
- Repeatable shifting force, which remains constant under all well conditions
- No equalizing position

Wireline operated, Garrett circulating valves allow communication to be established or shut off in a tubing string. The proven Garrett internal sliding sleeve design is more dependable because the sleeve travels in a one-piece body. All sealing is on one plane, eliminating the possibility of pressure lock or pressure shifting. As a further safety feature all screwed joints have triple seals with tapered threads that insure positive locking.

Garrett circulating valves are available in 1¼", 1½", 2" and 2½" sizes and in all popular thread connections.

*Check with your nearby Garrett field engineer for complete information and applications (he has information on those critical diameter parallel string dual completions, too). Call today.*

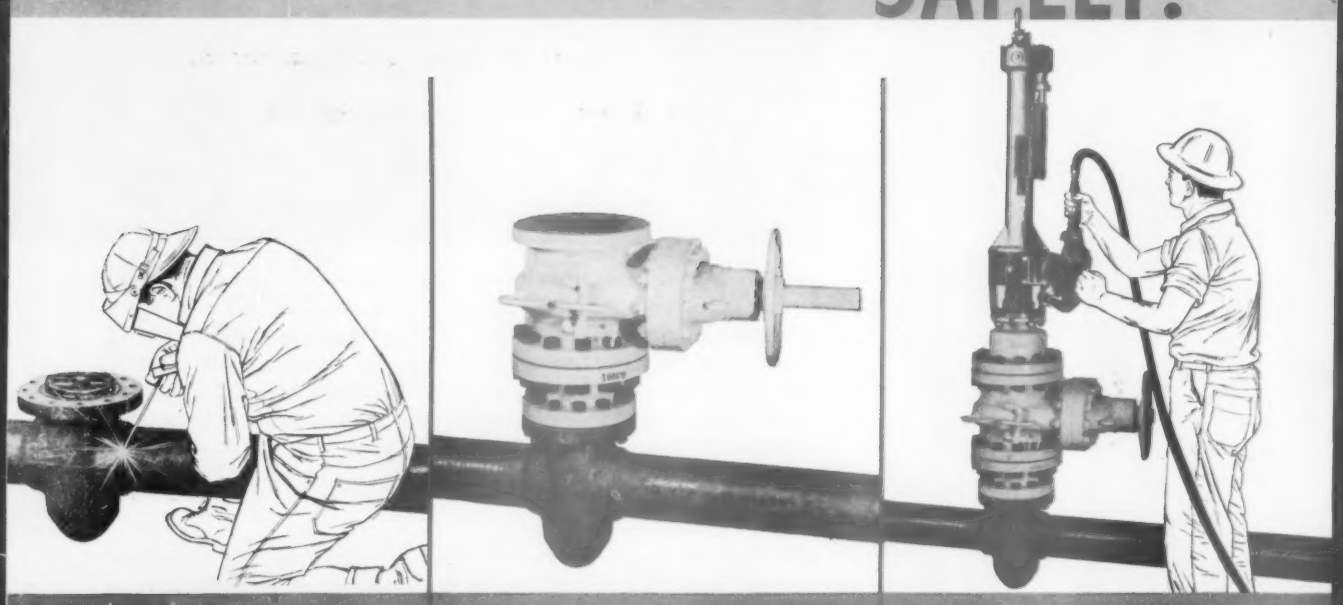
USI **Garrett Oil Tools**

Division of U. S. Industries, Inc., P. O. Box 2427, Longview, Tex.

Another GARRETT-ENGINEERED product

# KEEP IT

Tie-in lines and loops
Repair leaks
Remove and install equipment
**SAFELY!**



**STEP 1** Weld line stopper fittings to piping. Weld Save-A-Valve Drilling Nipples to piping to provide equalizing and purging connections.

**STEP 2** Align special gate valves and bolt securely to line stopper fittings. Attach small gate valves to drilling nipples.

**STEP 3** Bolt drilling machine to valve. Cut out sections of pipe to accommodate stoppers. Close valve and remove machine. Make cuts through drilling nipples.

**MUELLER® NO-BLO® METHOD**

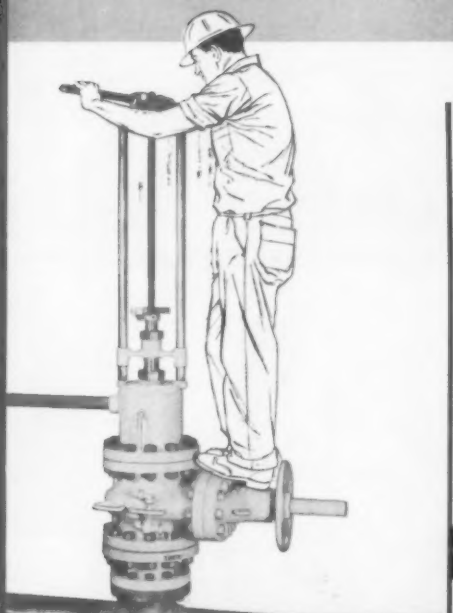
# FLOWING!

■ Just follow this simple step-by-step method for making fast, effective stop-offs with Mueller Line Stopper Fittings and Equipment.

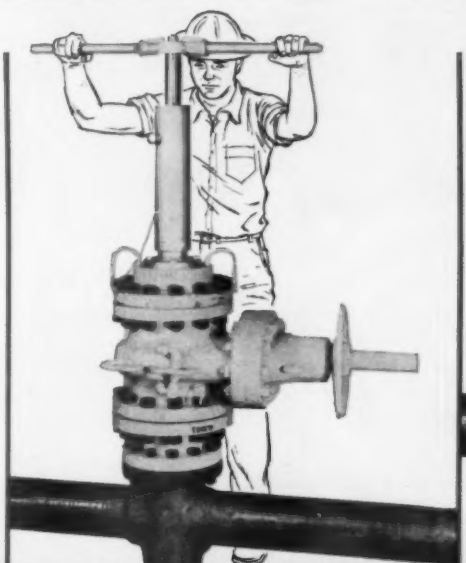
By making two such stop-offs and using a by-pass line, any section of your piping system can be completely isolated without interrupting the flow of fluid.

A by-pass connection built into the body of each Mueller Stopping Machine makes it easy to install a temporary by-pass line with a minimum investment in time and materials.

If desired, a separate by-pass line may be used. Write for complete information.



**STEP 4** Bolt stopping machines to valves. Connect by-pass and equalizing piping and divert flow. Make stop-offs. Section of piping now isolated for repair, replacement or tie-in.



**STEP 5** Close valve and remove stopping machines and by-pass. Install completion plug in top of fittings with completion machine.

**STEP 6** Remove all equipment. Bolt completion caps solidly to line stopper fittings. Cap drilling nipples.

MUELLER CO. Since 1857 SERVING the Water and Gas Industries QUALITY

**MUELLER CO.**
**DECATUR, ILL.**

Factories at: Decatur, Chattanooga, Los Angeles;
In Canada: Mueller, Limited, Sarnia, Ontario.

*Mueller Line Stopper Fittings and Equipment may be used on lines up to 12" in size at pressures as high as 500 p.s.i. on most models and temperatures to 250° F.*

# Naylor Lockseam Spiralweld Surface Casing offers

## MAXIMUM STRENGTH
## MINIMUM WEIGHT

NA1-0

**The Lockseam Spiralweld structure of Naylor surface casing provides greater strength—under pressure, compression and beam load—than any other iron or steel pipe of the same nominal wall thickness. The Lockseam carries the load, thus relieving the weld of any stress; the weld being principally a seal. The spiral helps to centralize Naylor casing in the hole . . . provides a "breathing space" . . . insures a better cementing job. For details on applications, specifications and test data, contact your nearest Mid-Continent representative.**

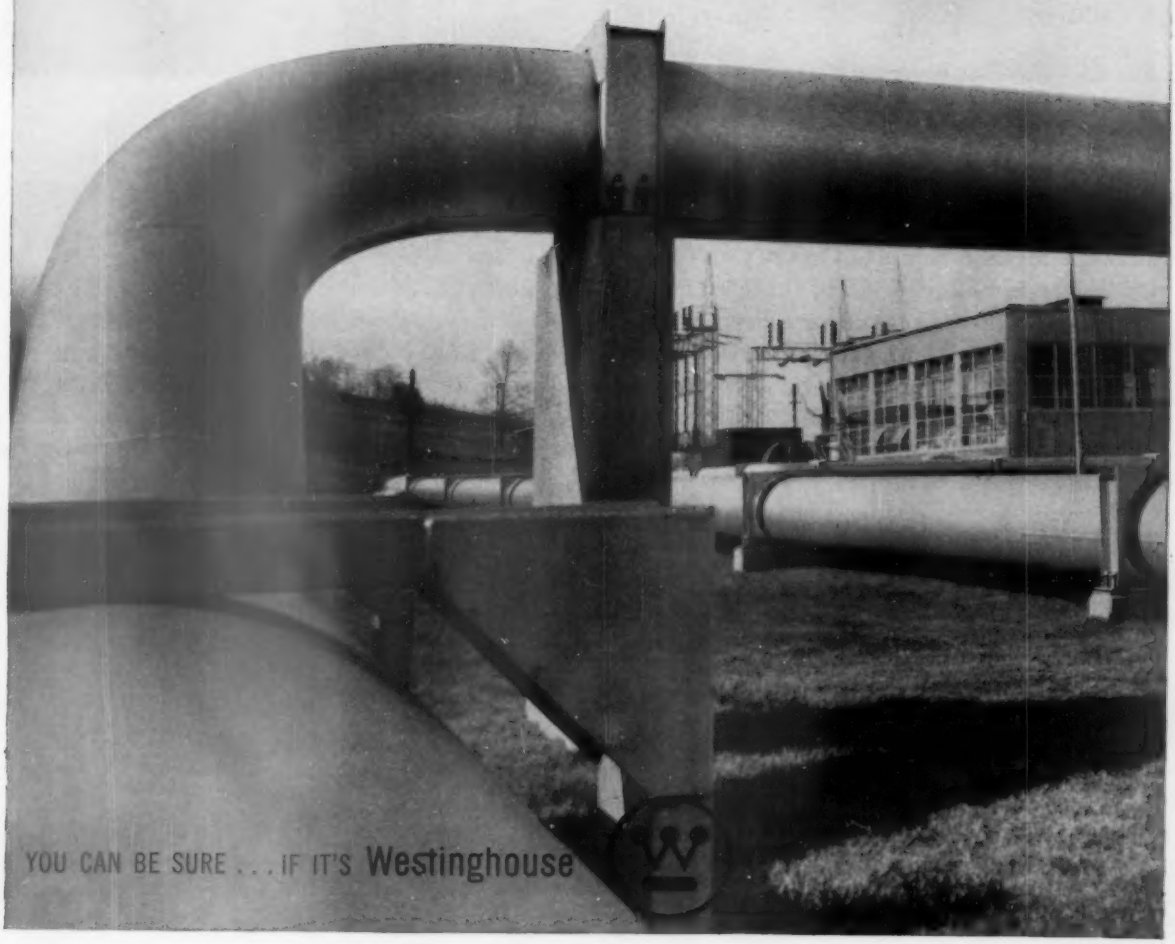
MID-CONTINENT — SUPERMARKET FOR THE OIL INDUSTRY

# MID-CONTINENT SUPPLY CO.

*THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY*

Mid-Continent Building, Fort Worth, Texas • Export Division: 45 Rockefeller Plaza, New York 20, N.Y. Cable: MIDCUMPORT NYK

# TEXAS EASTERN TRANSMISSION CORPORATION OBTAINS DEPENDABILITY, SAFETY AND ECONOMY OF OPERATION FROM WESTINGHOUSE EQUIPMENT



# WESTINGHOUSE EQUIPMENT KEEPS MT. PLEASANT

Texas Eastern's Mt. Pleasant station maintains a constant pressure of more than 900 psi on a pair of 30" pipelines to move gas some 60 miles to Gladeville, Tennessee. It forms a link in a pipeline system stretching from the Mexican border to Linden, New Jersey.

Westinghouse equipment was installed in this natural gas pumping station when it was constructed four years ago. "When the station was recently expanded to double its capacity, Westinghouse equipment was specified again. It has given dependable, safe service," asserts E. E. Blankenship, Station Chief.

The two Westinghouse transformers receive bulk power at 161,000 volts and reduce it to 4160 volts for direct utilization by a pair of 15,000-hp Westinghouse motors which supply the main power for the station's two huge compressors. The 900-rpm synchronous motors are coupled to speed increasers that step up the operating speed to 6500 rpm.

Two 225-kva transformers, also located in the main switchyard, supply the station's auxiliary system with 480 volts for blower fans, lube and seal pumps, lighting and the main control system. Stand-by pumps, to take over during a shutdown of one of the larger motors, are also supplied by the distribution circuit.

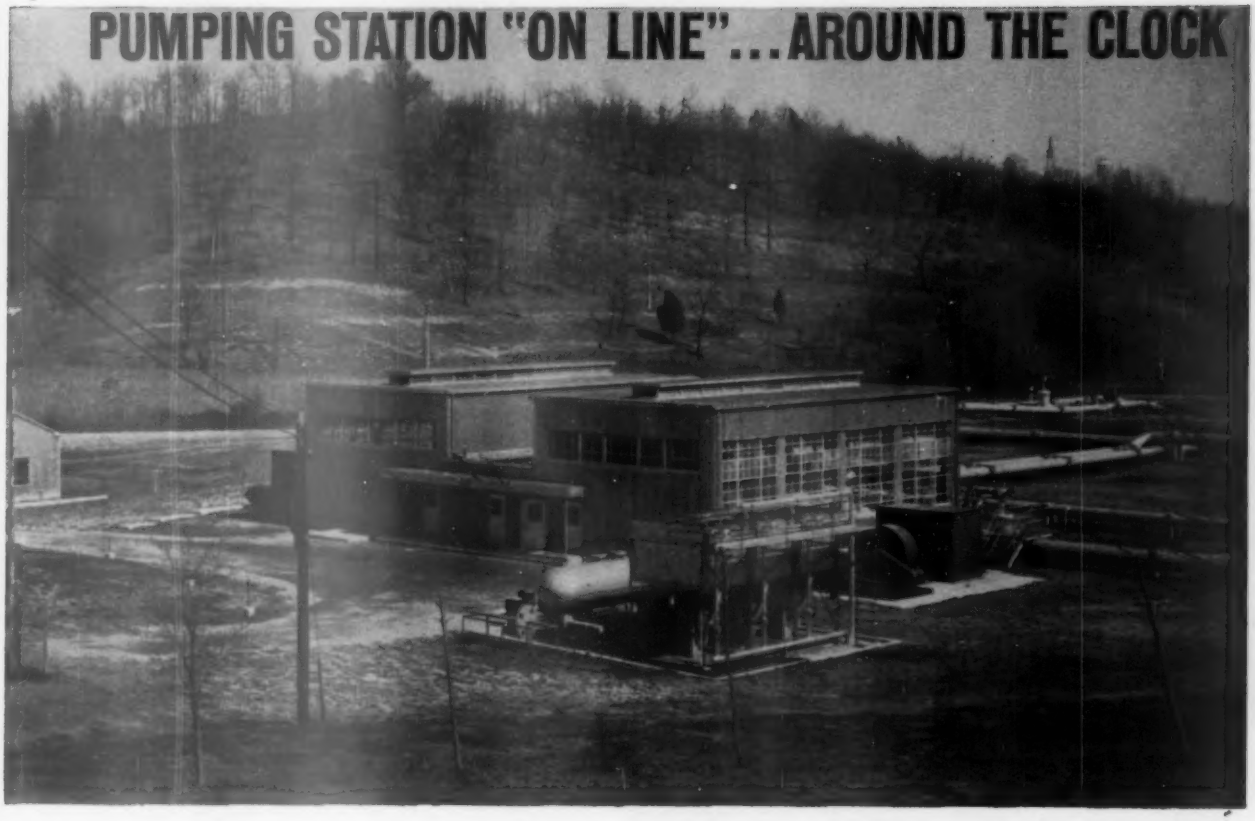
Centralized direction of the pumping station equipment is handled from the Westinghouse Control Console. A built-in safety system prevents compressor operation if oil temperature and pressure are not at a proper operating level.

Automatic sequence control systems form a sound basis for a new concept initiated by Westinghouse to help pipeline operators gain increased system efficiency while holding costs to a minimum. *Progressive Automation* is a long-term, step-by-step plan leading to economical automatic operation. Your nearby Westinghouse representative is ready now to help you formulate your individual *Progressive Automation* plan. Contact him today . . . or write Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa.

Westinghouse

(*continued*)

# PUMPING STATION "ON LINE"...AROUND THE CLOCK



EXCITER UNIT in the foreground excites the Westinghouse 15,000-hp main drive motor at one side of the Mt. Pleasant pumping station. E. E. Blankenship inspects the Westinghouse synchronous motor which is directly coupled to the gear unit to increase output from 900 to 6600 rpm. Equipment is duplicated for the second pumping unit.

ALL MOTOR CONTROL DEVICES are contained in this compact Westinghouse Control Center. Centralized location permits operators to quickly spot electrical faults. Front accessible cubicles speed inspection or repairs. Unit also contains instrumentation panel and relays to automatically regulate drive motors and compressor.

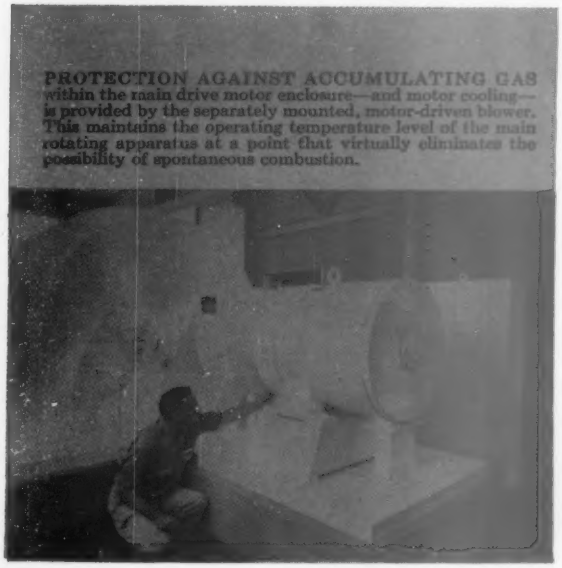
A SINGLE PUSHBUTTON on the operator's console initiates the automatic compressor start-up. A train of relays automatically sequence the pickup of station equipment step by step . . . while continually monitoring the pressures, speeds and other relevant factors. Approximately 10 to 12 minutes elapse before the station goes on line.

ELECTRICAL SYSTEM CONTROL is provided by the Westinghouse outdoor, metal-clad switchgear. Type DH horizontal drawout air circuit breakers in these cubicles protect the station transformers against possible faults on the secondary distribution system. Here Station Chief E. E. Blankenship checks the voltage level on the instrument panel. Cubicle also contains relays and metering equipment.

**TEXAS EASTERN TRANSMISSION CORPORATION SPECIFIES WESTINGHOUSE** *(continued)*

Main power for station is received at the substation switchyard. Westinghouse supplied the complete station, including the standardized overhead structure. Bulk power at 161,000 volts is received from the electric utility. Power circuit breakers and lightning arresters protect the transformers against faults on the utility line. The Westinghouse transformers reduce the voltage to 4160 volts to supply the 15,000-hp drive motors. J-96150

Westinghouse

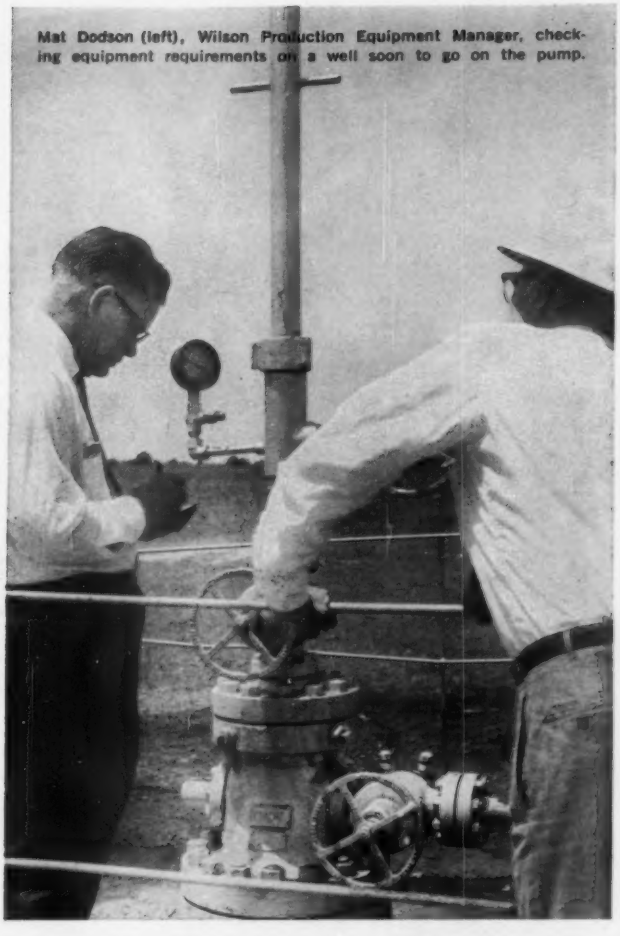


PROTECTION AGAINST ACCUMULATING GAS within the main drive motor enclosure—and motor cooling—is provided by the separately mounted, motor-driven blower. This maintains the operating temperature level of the main rotating apparatus at a point that virtually eliminates the possibility of spontaneous combustion.

CIRCUIT ISOLATION is provided by the 161-kv power circuit breaker so that the electrical equipment can be inspected or switchyard maintenance performed. After interrupting power to the station, the overhead switches can be operated from the ground to isolate either of the substation transformers and the electrical circuit beyond each unit. The self-supporting lightning protectors are insurance against a direct strike on the substation.

# SAVE PRODUCTION DOLLARS

use
WILSON SUPPLY
Production Equipment
Service



Mat Dodson (left), Wilson Production Equipment Manager, checking equipment requirements on a well soon to go on the pump.

**BEFORE** your well requires pumping equipment — call your Wilson Supply Production Equipment man. He'll help you plan your equipment needs . . . save you production dollars.

Your Wilson man **knows** pumping equipment . . . **knows** the conditions in your area. And along with his experienced knowledge, he can offer you a wide range of equipment engineered to fit your specific requirements. Both conventional beam-type units and EOT-Johnston Hydraulic units are available from Wilson.

Get the right help at the right time. Contact your Wilson Supply Production Equipment man **BEFORE** your well requires pumping equipment. He's an experienced hand at saving production dollars.

MAIN OFFICE and WAREHOUSE • 1301 CONTI STREET • HOUSTON, TEXAS
INTERNATIONAL DIVISION • 45 ROCKEFELLER PLAZA • ROOM 1701, NEW YORK

"WHAT YOU WANT — WHEN YOU WANT IT"

WILSON SUPPLY CO
HOUSTON TEXAS

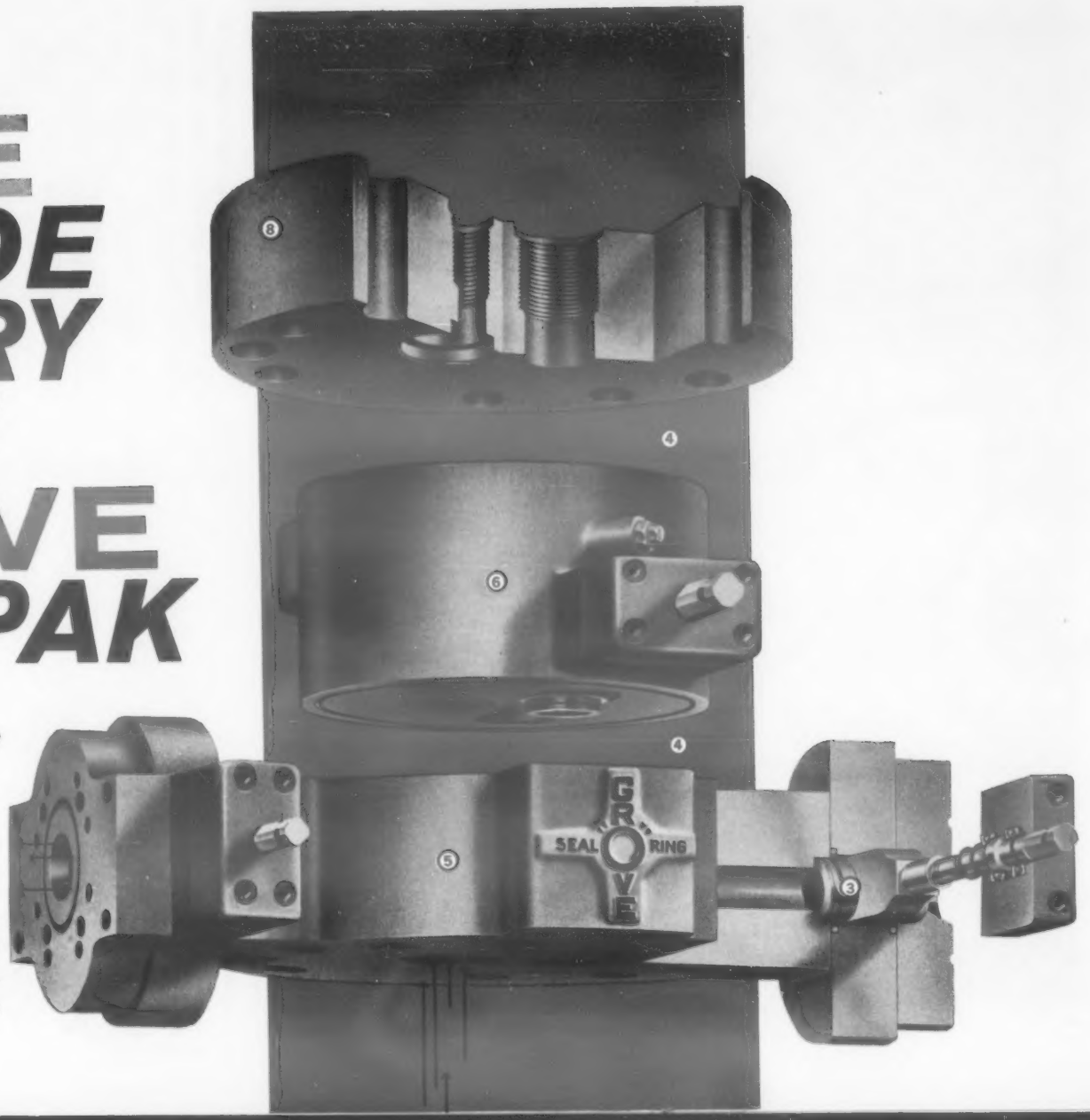
6025

# THE *INSIDE STORY* OF GROVE *VALV-PAK*

## Compact • Versatile

## Trouble-Free

Grove Seal-"O"-Ring® Valv-Pak combines the compactness and light weight of an integral Christmas Tree valve assembly with the flexibility of a conventional wellhead manifold that permits any single component to be changed without replacing the complete unit.



*CHECK THESE GROVE VALV-PAK FEATURES:*

1. Patented Grove Seal-"O"-Ring design for double-action seal. Metal inner seat rings give primary metal-to-metal seal backed up by O-Rings.
2. Precision-finished stems with lifetime lubricated ball bearings.
3. No lubricants or sealing compounds needed. Squeegee action of O-Rings against gate assures a clean polished surface for bubble-tight metal-to-metal seal.
4. Adaptable to meet any need. Unique Grove Valv-Pak construction gives ultimate flexibility. Valv-Pak can be factory tailored to your precise needs. Parts damaged by erosion or corrosion may be replaced in the field faster and more economically than with conventional designs.
5. Wing valve cross can be furnished in full opening or reduced port design.
6. Swabbing valve (optional).
7. Through conduit, full opening design for ideal flow characteristics and for accommodating down-hole tools.
8. Top and bottom flanges may be supplied to accommodate any wellhead fabricator's specification.
9. Studs furnished for all flanged outlets.

## GROVE PRODUCTION VALVES

**GROVE VALVE AND REGULATOR COMPANY**
A Subsidiary of Walworth

6529 HOLLIS STREET • OAKLAND 8, CALIFORNIA
Offices throughout the United States and in Western Canada

# Plant saves $60,000 per month by switch to pipe lined with TEFLON®

In a plant manufacturing a chemical intermediate, excessive maintenance costs and product losses ran as high as $60,000 per month. Such frequent failures occurred in the process involving corrosives at high temperatures and pressures, that onstream time averaged only 75% during the first six months of operation. After a period of testing, more than 1500 feet of pipe lined with Du Pont TEFLON TFE-fluorocarbon resin were installed. Result: No failures of lined pipe occurred in over 2 years of service.

TEFLON TFE resins are unaffected by HCl liquid and vapors, fuming nitric acid—white or red—hydrofluoric acid, organic solvents and reagents. TFE resins are rated for use up to 500°F. Their non-adhesive surfaces prevent plugging by high-viscosity materials. TFE resins do not shatter under vibration, thermal or physical shock.

The liner flared over the flanges provides protection for the steel from the process fluid and eliminates the need for additional gasketing. Installation costs are further reduced because the pipe is equipped with standard flanged fittings which are easily connected. And the need for careful aligning, hanging, welding and other special procedures is eliminated.

In your petrochemical processes, you can insure long service life and greatly reduced maintenance and downtime by installing pipe lined with TEFLON TFE resins. For more details on properties and performance send for the new bulletin on Lined Pipe . . . and for more general information, ask for the fact-filled booklet, "Designing with TEFLON". Write to: E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Department T-30-8, Room 2526, Nemours Building, Wilmington 98, Del. **In Canada:** Du Pont of Canada Limited, P. O. Box 660, Montreal, Quebec.

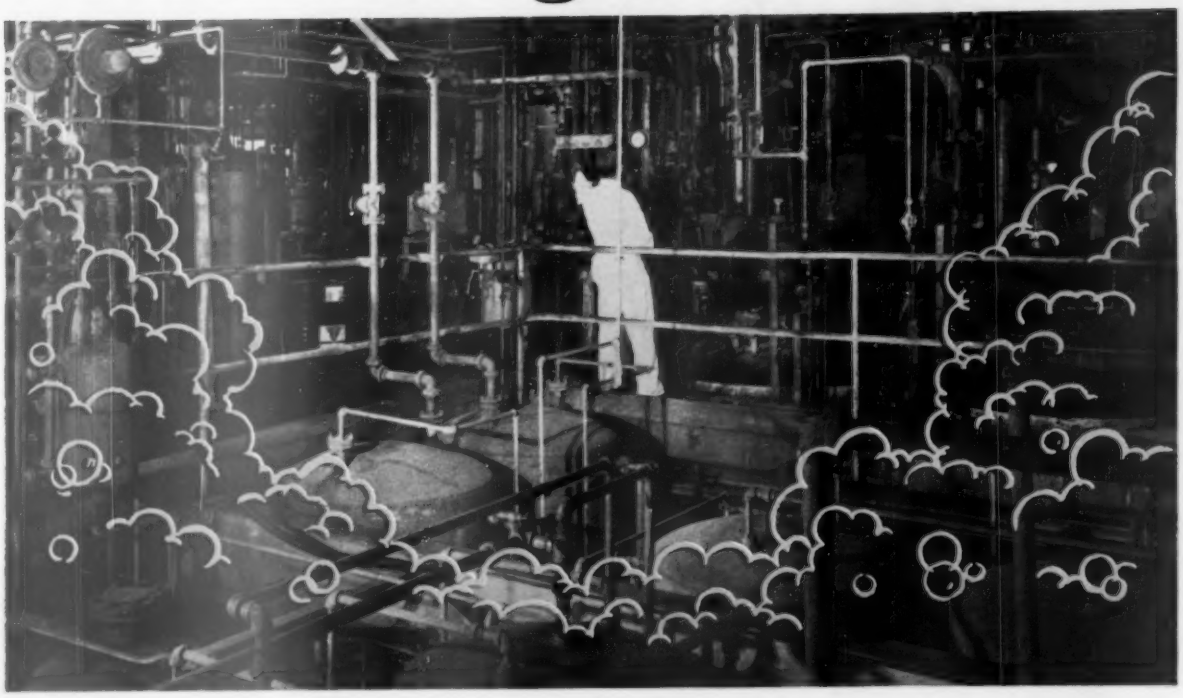
DU PONT REG. U.S. PAT. OFF. TEFLON® FLUOROCARBON RESINS

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

*TEFLON is Du Pont's registered trademark for its family of fluorocarbon resins, including TFE (tetrafluoroethylene) resins and FEP (fluorinated ethylene propylene) resin.*

**SILICONE NEWS from Dow Corning**

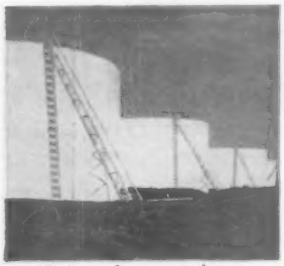
# Foam Eating Into Profits?



## Job-proved Dow Corning Defoamers Speed Processing, Raise Capacity

Ever try to blow up a balloon with a hole in it? Hard to get it up to any size, isn't it. The same's true of foamers . . . with Dow Corning Silicones added. Silicones put holes in bubbles . . . keep systems foam-free! They're perfect foam controllers: reliable, economical, safe, easy to use . . . quickly available from Dow Corning warehouses conveniently located to expedite shipment to you.

***No Hold-Ups. No Foam-Overs.*** Production slow-downs caused by foam are eliminated when fast-working Dow Corning Silicones are added to systems. The absence of foam permits you to make more efficient use of equipment, step up production and meet schedules never before thought possible. Capacity is increased, and foam-overs are prevented . . . thereby cutting cost of clean-up and maintenance and helping reduce fire hazards.



Eliminate foam-overs here.

***What's Your Foamer?*** Today, Dow Corning Silicones are used both as antifoamers and as defoamers in processing chemicals, petroleum products, asphalt, textiles, paper, paints, adhesives . . . in metalworking and laboratory work . . . in virtually every industry and process — even in food processing where the use of Dow Corning Silicones at designated levels is sanctioned by FDA.

If you're troubled with foam slowing down your plant operation, taking up productive capacity, or creating maintenance, it'll pay you to test Dow Corning Silicones.

***New Literature and Free Sample.*** A new 8-page manual, "The ABC's of Defoaming", will help you learn all the facts about Dow Corning silicone defoamers . . . how and where to use them, examples of the small quantities of silicones needed to control foam, and typical successful applications. Write today for your FREE copy and ask for a generous FREE SAMPLE of the silicone defoamer that you can test . . . that will likely give you the most efficient, most economical defoaming action. Indicate your type of foamer: aqueous, oil, food or other. Address Dept. 6208.

Write today for new 8-page brochure, "How Silicones Work for the CPI". Yours Free!

first in silicones

**Dow Corning CORPORATION**
MIDLAND, MICHIGAN

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Reporting more news from...

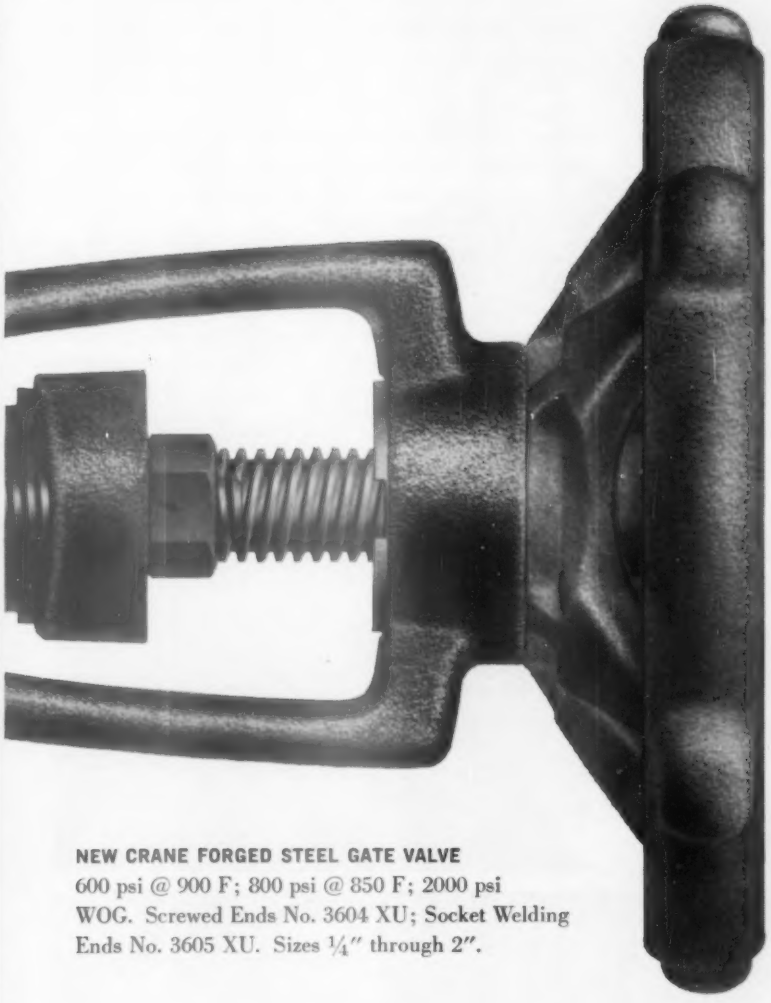
# CRANE DIRECTION '70

...a fast-moving program of planned expansion, product development, and streamlined distribution to help our customers meet the competitive challenges of the Sixties.

# COMPLETELY

# REDESIGNED!

## THE NEW SMALL FORGED STEEL GATE VALVE



**NEW CRANE FORGED STEEL GATE VALVE**
600 psi @ 900 F; 800 psi @ 850 F; 2000 psi WOG. Screwed Ends No. 3604 XU; Socket Welding Ends No. 3605 XU. Sizes ¼" through 2".

This is a whole new valve, not just one with a new feature added. This redesign incorporates all the features you told us you wanted plus a few others we know will make this valve a better buy in terms of longer service life, less maintenance, easier and faster servicing.

Like the new "bow-leg" yoke, which for the first time gives you plenty of hand room for easy stuffing box maintenance. And like the long-life braided asbestos packing, with Inconel wire insert. The "universal" trim that can be used for either oil or steam, eliminating many of your stocking problems. The spiral wound stainless steel bonnet gasket with asbestos filler, made blowout-proof with a male-female joint.

But what we really want you to remember, more than any single feature, is that this Crane valve is the newest—all new—valve on the market . . . well worth considering when you need small, high-pressure steel gate valves. We'd like you to compare this new valve with any other comparable valve feature for feature.

Your local Crane distributor has technical literature and a complete selection of these valves right in stock. Call him on small steel gates. In fact, he's your best bet to call no matter what valve you want because he carries the broadest line of quality valves in the world.

CRANE

*CRANE CO., INDUSTRIAL PRODUCTS GROUP*
*4100 S. KEDZIE AVE. • CHICAGO 32, ILL.*
**VALVES • ELECTRONIC CONTROLS • PIPING**
**PLUMBING • HEATING • AIR CONDITIONING**

# engine power BY CATERPILLAR

# THIS CATERPILLAR D397 DIESEL IS OPERATED BY FINGER TIP 122 MILES AWAY

The Cat D397 shown below is the sixth repeat order by this company's Pipeline Department. "The Caterpillar Diesel has reliability and economy that have proved to be very satisfactory for this pipeline application," says Division Superintendent V. J. Hansen.

This booster station on the pipeline system of a major midwestern oil company is located at Sauk Centre, Minnesota. It is remotely controlled from Moorhead, 122 miles away. It can also be controlled from any point on the system of leased telephone circuits.

Automatically controlled by dial code over leased telephone lines, this pumping station, powered by a Caterpillar D397, has a record of 99 per cent reliability.

Diesel is preferred to electric power, first, because lack of electricity in the vicinity means high construction costs for the needed facilities. Second, with diesels, no standby or demand charges build up operating costs. And third, the better speed variability of diesels is more efficient for this installation because the station is downstream from a terminal that sometimes takes full receipts, sometimes only half and sometimes none.

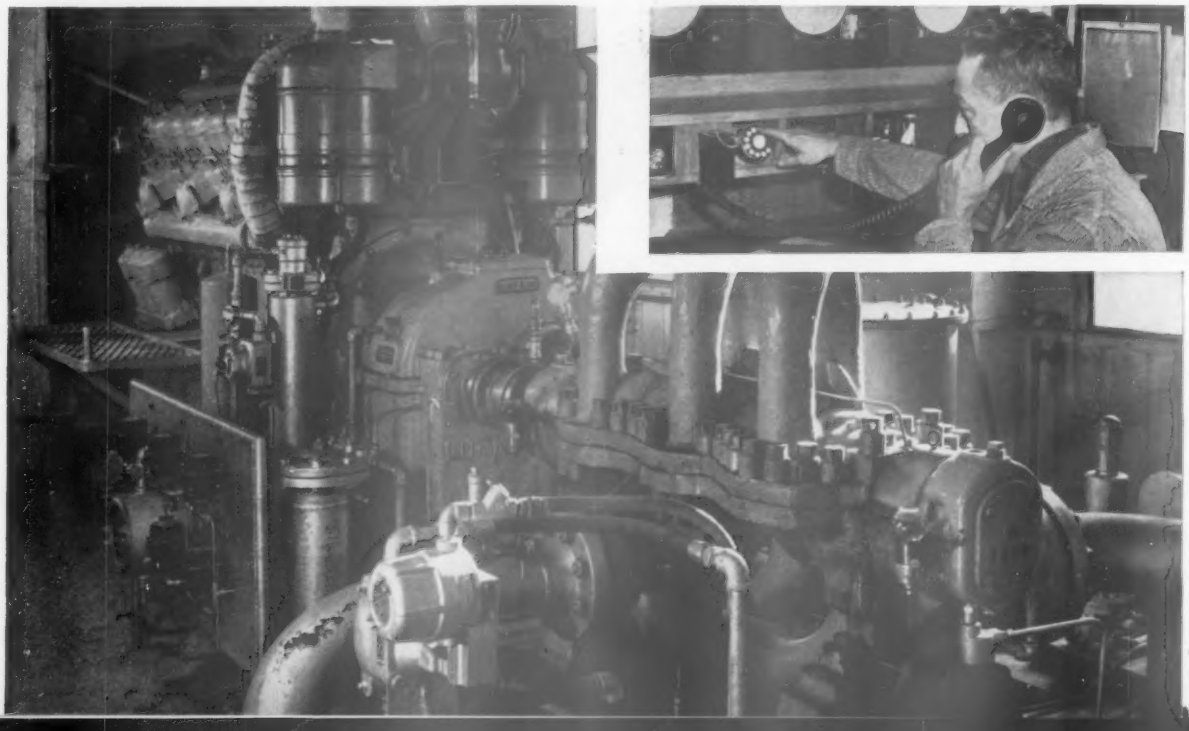
The Caterpillar Turbocharged D397 Diesel is rated 650 maximum HP. This engine is also available in 7.5:1 and 10.5:1 compression ratio Natural Gas versions for extra economy where this low-cost fuel is available. Your Cat Dealer will recommend the right power for your job from the 75 HP D311 to the big D397. Call him today. And remember to specify Caterpillar when ordering new equipment.

**CATERPILLAR**

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

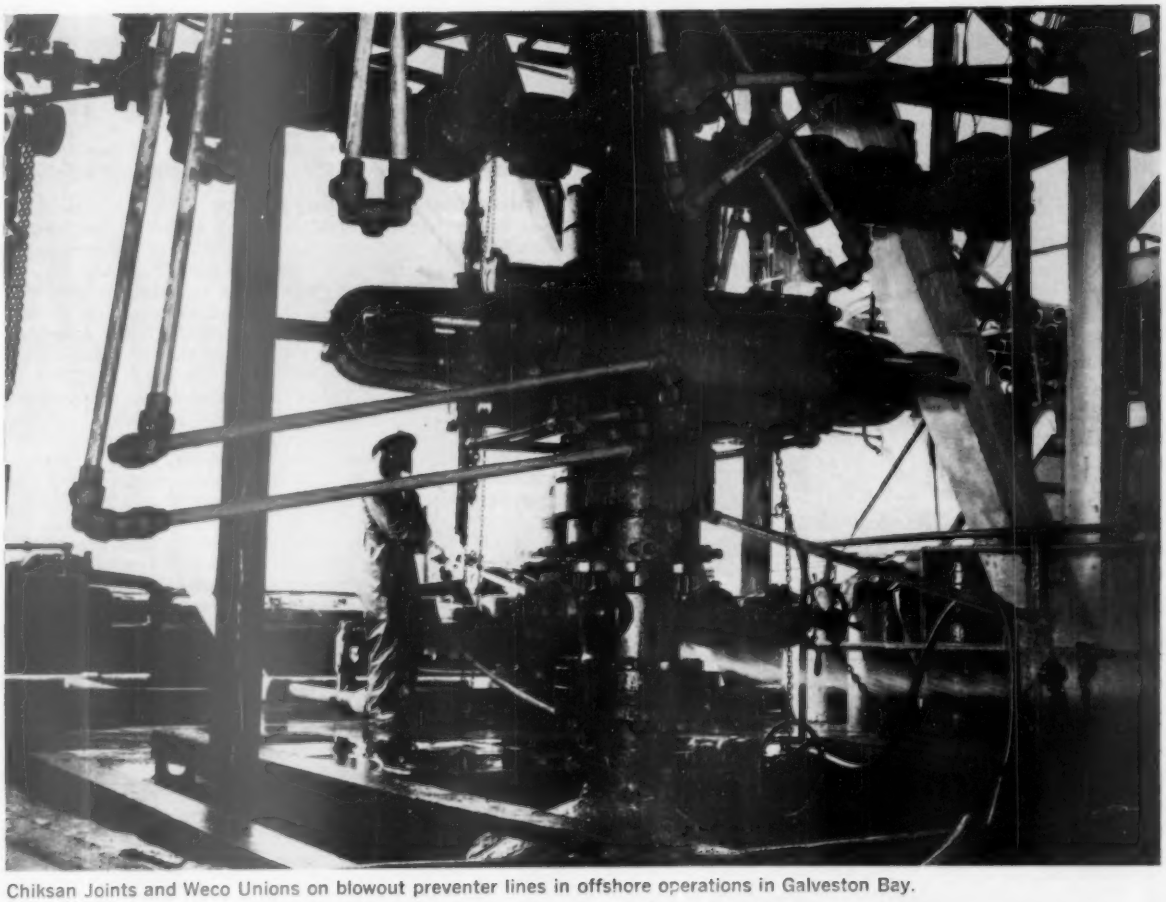
Engine Division, Caterpillar Tractor Co., Peoria, Ill.





# ON BLOWOUT PREVENTER LINES–

## *Chiksan Swivel Joints insure high safety factor*



Chiksan Joints and Weco Unions on blowout preventer lines in offshore operations in Galveston Bay.

**Convincing proof** that Chiksan Swivel Joints measure up under severe conditions is shown in the following destruction test report: "In open flame trials, Chiksan Swivel Joints, under pressure of 1800 PSI, were subjected to flames reaching 650°F. The Swivel Joints functioned satisfactorily for a full 60 minutes—55 minutes longer than the time deemed necessary for the effective operation of the blowout preventer."

**In foul weather** and in rough handling Chiksan Joints stand up best. Long service life and minimum maintenance are other major reasons for selecting Chiksan.

**Standardize on Chiksan** Swivel Joints for all your drilling and production needs. You'll find Chiksan Joints and their partner Weco Unions in major supply stores everywhere.

CHIKSAN fmc

A SUBSIDIARY OF FOOD MACHINERY AND CHEMICAL CORPORATION

#60-50

CHIKSAN COMPANY—Brea, California • Chicago 5, Ill. • Newark 2, N. J. • Divisions: Chiksan International, Hamer Valves, Weco • Subsidiary: Chiksan of Canada Ltd.

# CONTACTOR

ISSUE 4

## GLYCOL PROCESS AND DESIGN OPERATING INFORMATION

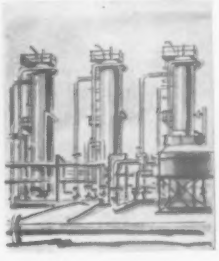
*Proper use of glycols in well designed, correctly operated equipment is essential for efficient gas treating Some of these important design and operating considerations will be discussed in this series.*

### Dehydration with Glycols

Desiccant systems based on diethylene and triethylene glycol offer a number of economic advantages over solid dehydration units. For example, initial capital investment is less, desiccant make-up costs are lower, and operating expenditures are reduced by ⅓ to ½.

Since each operation should be considered as a special case, the following information about DEG and TEG is presented to help you determine the type of glycol best suited to your particular requirements.

### Diethylene Glycol



Advantages:

**1.** It is stable in the presence of sulfur, oxygen and carbon at normal operating temperatures.

**2.** It is highly hygroscopic.

**3** Carry-over losses are small.

**4.** It does not solidify in a concentrated solution.

**5.** It is non-corrosive.

Disadvantages:

**1.** Carry-over is greater than with TEG.

**2.** It cannot easily be regenerated to greater than 95% solution.

**3.** Dew point depression of 30-60° F. is less than with TEG. (Dew point depression is usually about 50° F.)

When oxygen and hydrogen sulfide are absent, reboiler temperatures may be raised to 330-350° F. to obtain higher concentrations of glycol and consequently greater dew point depression. Care should be exercised when using temperatures in excess of 325° F.

### Triethylene Glycol

In *addition* to the advantages offered by DEG, triethylene glycol offers the following:

**1.** Higher dew point depressions of from 80 to 140° F. can be obtained if the TEG is dried sufficiently during regeneration.

**2.** TEG is easily regenerated to a 98-99.5% or higher solution in an atmosphere stripper because of its high boiling point.

**3.** It has a theoretical decomposition temperature of 404° F., while the temperature of DEG is 328° F.

**4.** Vapor pressure is 20% lower than DEG at 80° F. Thus, vaporization losses are lower.

**5.** Simpler regeneration equipment is required.

**6.** Dehydration is less expensive than with DEG — both in operating and capital costs.

Disadvantages:

**1.** The presence of light liquid hydrocarbons produce a tendency for foaming. The use of anti-foam agents is indicated to help control this condition.

**2.** Normally, it is not possible to obtain dew points as low as with solid desiccants.

In some instances, it may be possible for an operator to convert DEG units for use with triethylene glycol.

### Operating Considerations

Gas temperature is a determining factor in the operation of liquid desiccant plants. Dew point depression as high as 96° F. has been obtained with TEG and 65° F. with DEG. If gas temperature is too high to give the desired water content in the dried gas, cooling should be considered. Since the initial cost of a TEG dehydration plant is generally less than half that of a dry desiccant plant, expenditure for cooling the gas is justified.

Methods of cooling fall into three basic categories: (1) Cooling by expanding the gas just ahead of the dehydrating unit . . . if pressure drop is available; (2) Use of various types of water coolers; and (3) Refrigeration. This may be accomplished by compressing the gas, removing the heat of compression and expanding, or by use of an external refrigeration unit.

In cases where an operator has an existing glycol dehydration plant which cannot meet newer, more rigid specifications for water content, consideration should be given to cooling the inlet gas or treating the gas from the glycol dehydrator in a small solid desiccant unit. These steps should be sufficient to place an existing glycol unit back into useful operation.

In cases where cooling does not provide sufficient water removal, a small solid desiccant unit may be used. This is practical, since much smaller units are needed than would be required for complete removal of water contained in the gas.

Cost of operating a glycol dehydration plant is approximately 20-60 cents per million standard cubic feet of gas. The economy of this system is apparent when one considers the cost of operating a dry desiccant plant, which is in the range of $0.60-$1.20 per million standard cubic feet of gas.

*FOR MORE INFORMATION,* look for future issues of Allied Chemical Contactor featuring articles on ethanolamines and glycols in gas treating operations.

We will gladly send technical data, delivery and price information on Allied Chemical Ethanolamines and Ethylene Glycols.

*For specifications and local offices, see our insert in Chemical Materials Catalog, pages 475-482 and in Chemical Week Buyers Guide, pages 37-44.*

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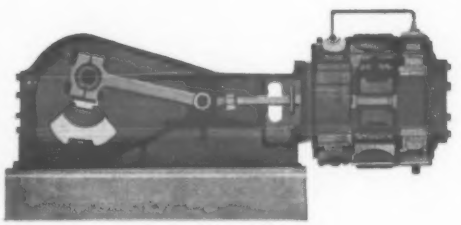


# HIDDEN VALUES?

## Are they all in Worthington Horizontal Compressors?

Frankly, they're not. And we're glad! One of the "hidden values" listed below we'd hate to sell—see if you can tell which one it is. (Correct answer on page 243.)

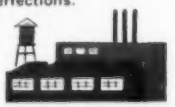
On the other hand, we're extremely happy to be selling horizontal compressors with the other 24 "hidden values" built in. (Not everyone does.)

Frankly, we could drop many of these and 99 users out of 100 might never know it. But the 100th could suffer untold expense . . . so we keep them all for everyone. To buy these "hidden values", please contact your local Worthington representative next time you specify a compressor. Worthington Corporation, Compressor and Engine Division, Buffalo, N. Y. 36-10

**SALES AND SERVICE INTEGRATION** recognizes kinship of one to the other. One man administers both.

**MAGNAFLUX AND MAGNAGLO** inspections are widely used to expose surface imperfections.

**ADJUSTABLE ROLLER MAIN BEARINGS** feature low friction losses which help to extend compressor life.

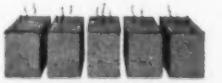


**INTEGRATED DIV.** includes foundry, manufacturing, sales, service and engineering in one location.

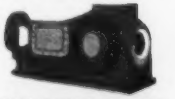
**FEATHER VALVE** — industry's preferred compressor valve—is efficient, quiet, and low in maintenance.

**CAPACITY CONTROL** —choice of simple bypass, through dual to complex sequential control systems.

**FLEXIBILITY** — oil or non-lube; single or multi-stage; Worthington MVD, direct or geared drive.



**PARCO-LUBRITING** of critical wearing surfaces completely eliminates most start-up scuffing problems.



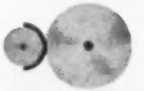
**ONE-PIECE FRAME** includes built-in housing with full foundation support to minimize stresses.

**2000 CRAFTSMEN,** these units built by same men who design and build large 5000 hp, 15,000 psi units.

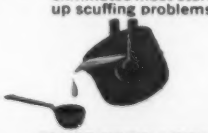
**KOLENE PROCESS** removes impurities from crankpin bearing shell that weaken bond to babbitt.

**OPTIC COMPARATOR** is used to check connecting rod bolt threads for uniform angles, lead and form.

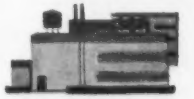
**FACTORY ASSEMBLY** and shop run-in on air insure proper operation and reduce installation costs.



**FINISHED GROUND BEARING SHELLS** provide crankpin positive full-contact backing for long life.



**COMPOSITION TEST** determines constituents of molten iron in each ladle before any casting is poured.



**$1,000,000 ADDITION TO LABORATORY** assures sound equipment designs based on actual research.

**COUNTERWEIGHTED CRANKSHAFT** eliminates vibration and insures a smoother operation.

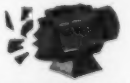
**DISTRIBUTORS** — over 200 in major markets give local supply and close contact with Worthington offices.

**FULL-FLOATING WRISTPINS** in piston give minimum piston and cylinder wear and reduce maintenance.

**STOCKING PROGRAM** standard air and gas gathering units are kept in stock to give short shipments.

**PROFILOMETER** inspection of highly finished parts assures easy break-in and long life.

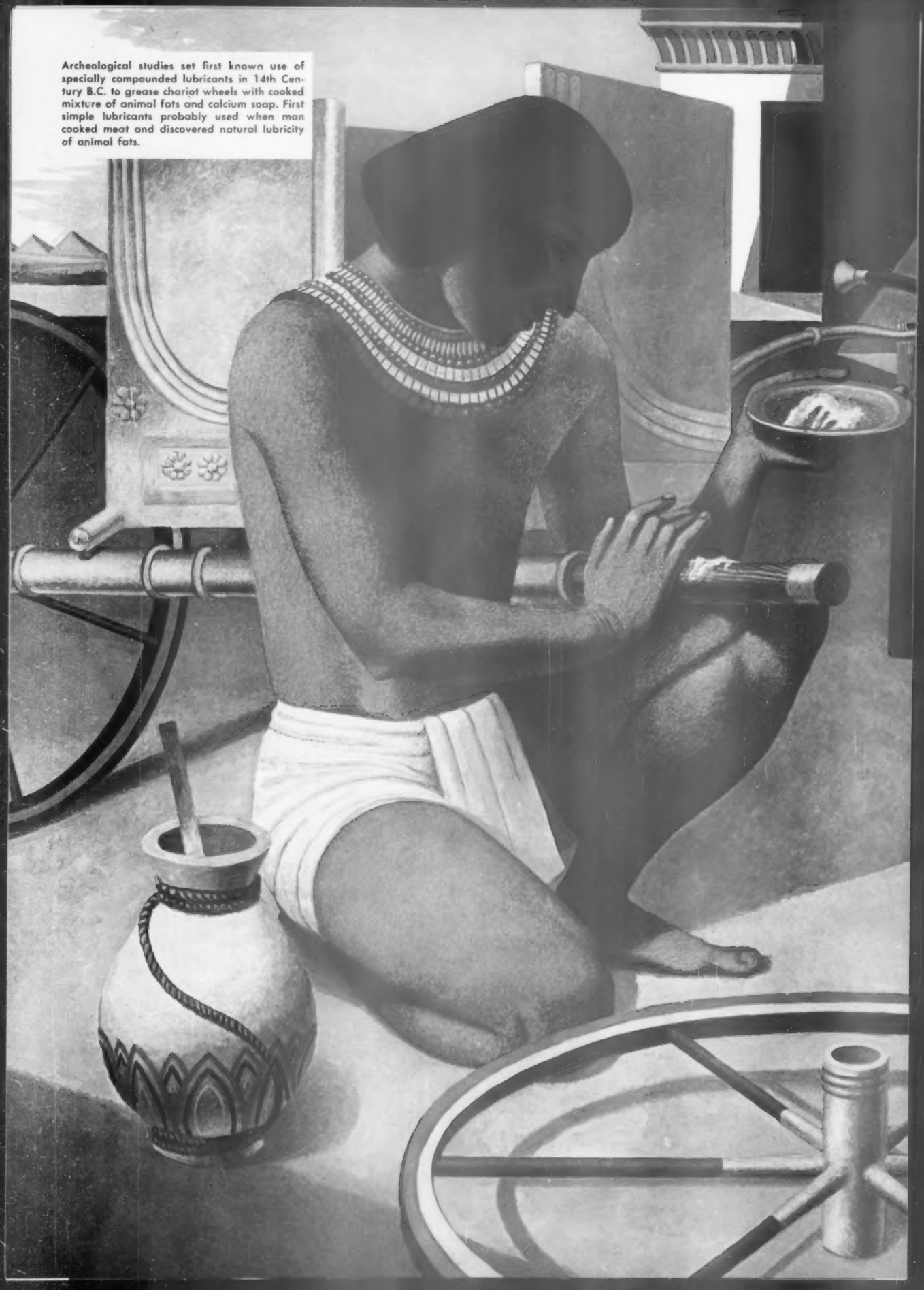
**THERMODYNAMICS SECTION** analyzes special application to size unit and determines performance.



**DESTRUCTION TEST** of complete compressor cylinders verifies engineers' design calculations.

**ULTRASONIC TEST** — an advanced method of examining certain critical parts for internal quality.

**ACCESSIBILITY** — valves, packing and main parts are easily observed and reached by operators.



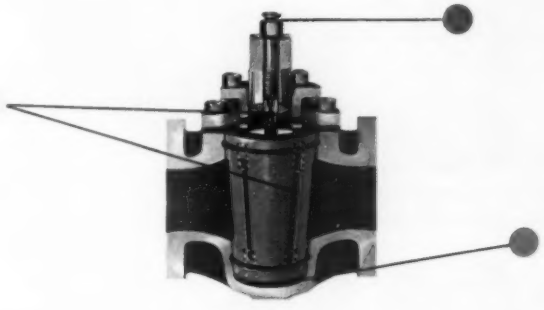
Archeological studies set first known use of specially compounded lubricants in 14th Century B.C. to grease chariot wheels with cooked mixture of animal fats and calcium soap. First simple lubricants probably used when man cooked meat and discovered natural lubricity of animal fats.

# he greased the wheel of progress

## *. . . and his idea helped give you a better valve*

One day about thirty centuries ago an ingenious charioteer silenced a squeaky chariot wheel with a handful of grease. To his surprise, the wheel not only ran quietly, but easier. Man had learned that lubrication makes things work better . . . and last longer.

Lubrication in Rockwell-Nordstrom lubricated plug valves does more than make them close easier and far outlast non-lubricated valves. *Pressurized* lubrication also hydraulically jacks the plug minutely from its seat, insuring easy operation and also maintaining a powerful seal against leakage around the plug . . . a seal that is instantly replaceable and can't be "worn out" like exposed metal-to-metal seats. For just a few of the reasons why you'll get better flow control at far lower cost with Rockwell-Nordstrom lubricated plug valves, examine the illustration below.



**HOW LUBRICATION MAKES A BETTER VALVE**

- Lubricant quickly, easily injected through Rockwell fitting.
- Lubricant travels through Sealdport® system to create powerful seals against leakage and prevent metal-to-metal wear between plug and body . . . note seats never exposed to the line.
- Lubricant hydraulically jacks plug minutely from seat for instant quarter-turn operation.

Rockwell-Nordstrom is the original and world's most complete line of lubricated plug valves. Available in sizes from ½" to 36" and pressures to 15,000 lb. For additional information, see your supplier or write: Rockwell Manufacturing Company, Pittsburgh 8, Pennsylvania. Canadian Valve Licensee: Peacock Brothers Limited. If you live outside the USA, write: Rockwell International S.A., Geneva, Switzerland.

*Lubrication Makes The Difference*

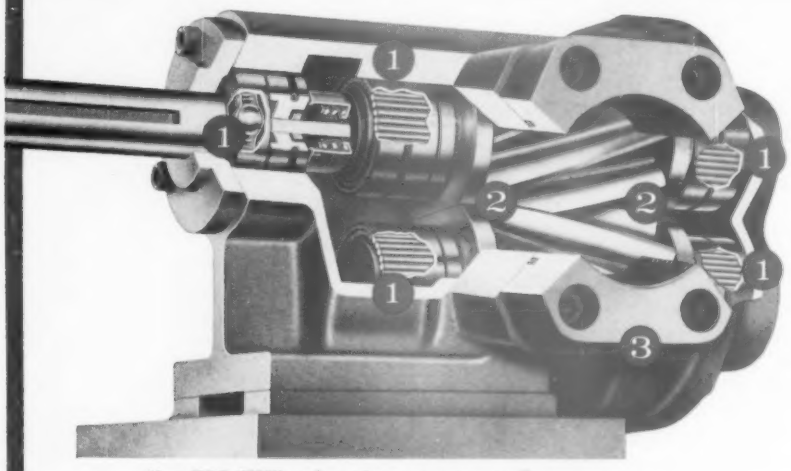
ROCKWELL-Nordstrom VALVES

another fine product by

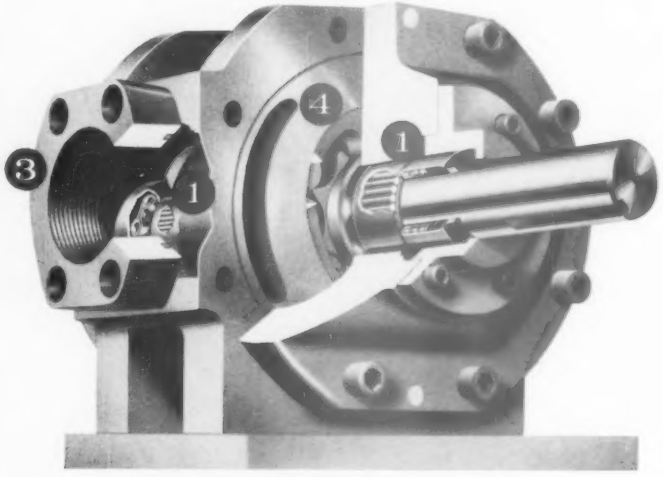
ROCKWELL

Now from Brown & Sharpe . . .

# New rotary pumps with extra long life – built for the Petroleum Industry




**New B&S "300" series rotary gear pumps.** For pressures to 300 psi; caps. of 40, 60, 90, 125, 175 gpm.




**New B&S "700" series gerotor pumps.** For pressures to 1000 psi; caps. of 20, 30, 40, 60, 80 gpm.

1. Heavy duty, needle-type antifriction main bearings for radial loads and ball thrust bearings for axial loads in all pumps.

2. Replaceable wear plates prolong pump life. You replace plates after normal wear, not pumps.

3. Available with plain or threaded pipe flanges which can be quickly changed by removing flange screws. Removable flanges eliminate pump replacements caused by damaged welds or threads. Pumps can also be removed easily from the line, without disturbing piping.

4. Unique gerotor design gives exceptionally long life to the Brown & Sharpe "700" series gerotor pump. Rolling contact between the inner and outer elements progresses at a relative speed only ⅛ that of driven speed.

## You save on installation and maintenance, too

These new Brown & Sharpe Pumps have been designed and perfected specifically for the Petroleum Industry, to save you money right down the line. Start saving now.

Contact your oil field supply house about new Brown & Sharpe pumps. Ask them for a catalog, or write: Hydraulics Div., Brown & Sharpe Mfg. Co., Providence 1, R. I.

**Brown & Sharpe** PRECISION CENTER

# 14,625′ down—cemented with success

At all depths, UNAFLO oil-well cement provides a slurry that follows the irregularities of well bore and pipe . . . remains fluid under down-the-well temperatures and pressures . . . stays pumpable after a period of rest . . . is easily reversed out . . . yet sets hard to provide an adequate seal. That's because the retarded set of UNAFLO sustains high initial fluidity. This postponement of initial thickening allows ample time for proper placement plus a margin of safety for delays or emergencies.

For cementing or recementing, for plug-backs or squeezes, at varying depths, pressures and drilling conditions, UNAFLO cement provides the workable slurry — one that pumps easily, sets hard. For more data, write Universal Atlas Cement, 100 Park Avenue, New York 17, N. Y.

"USS" and "Unaflo" are registered trademarks

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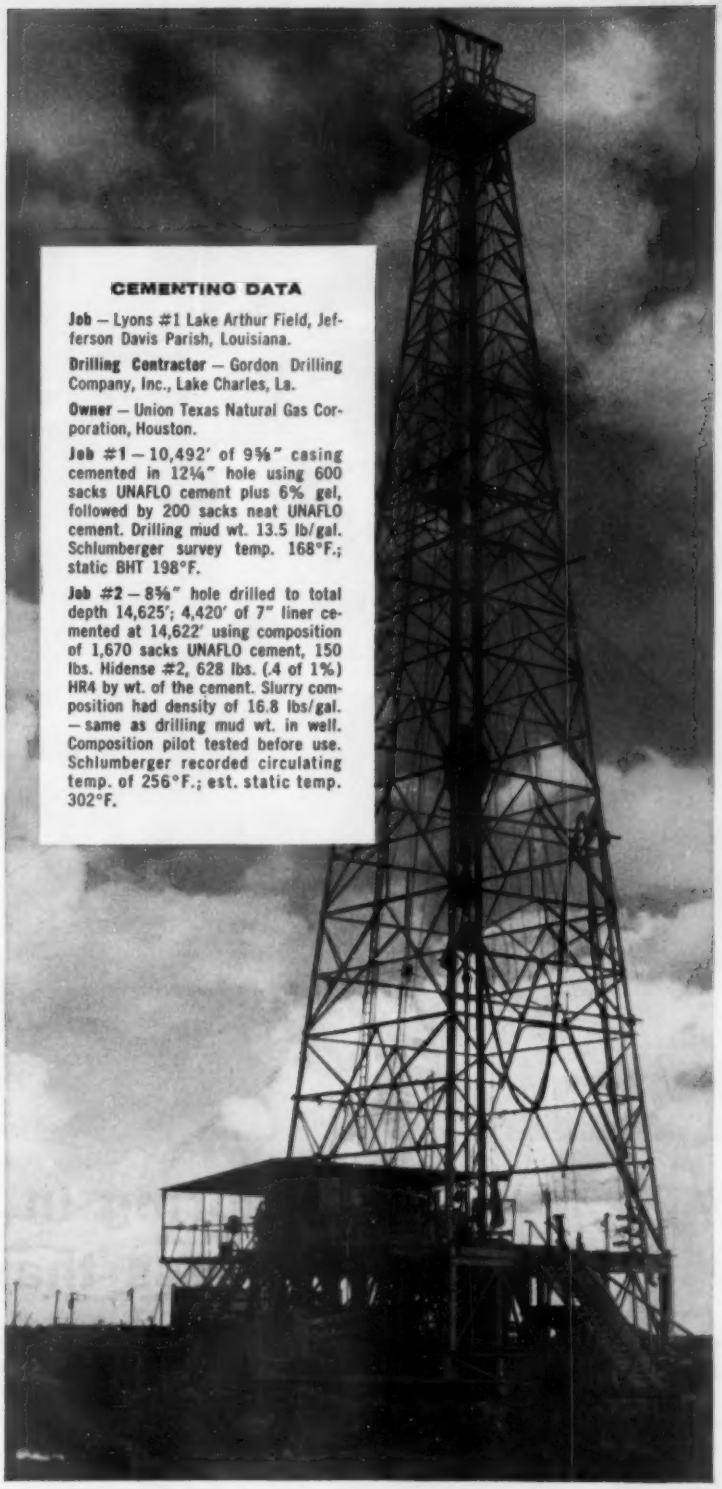


**CEMENTING DATA**

**Job** — Lyons #1 Lake Arthur Field, Jefferson Davis Parish, Louisiana.

**Drilling Contractor** — Gordon Drilling Company, Inc., Lake Charles, La.

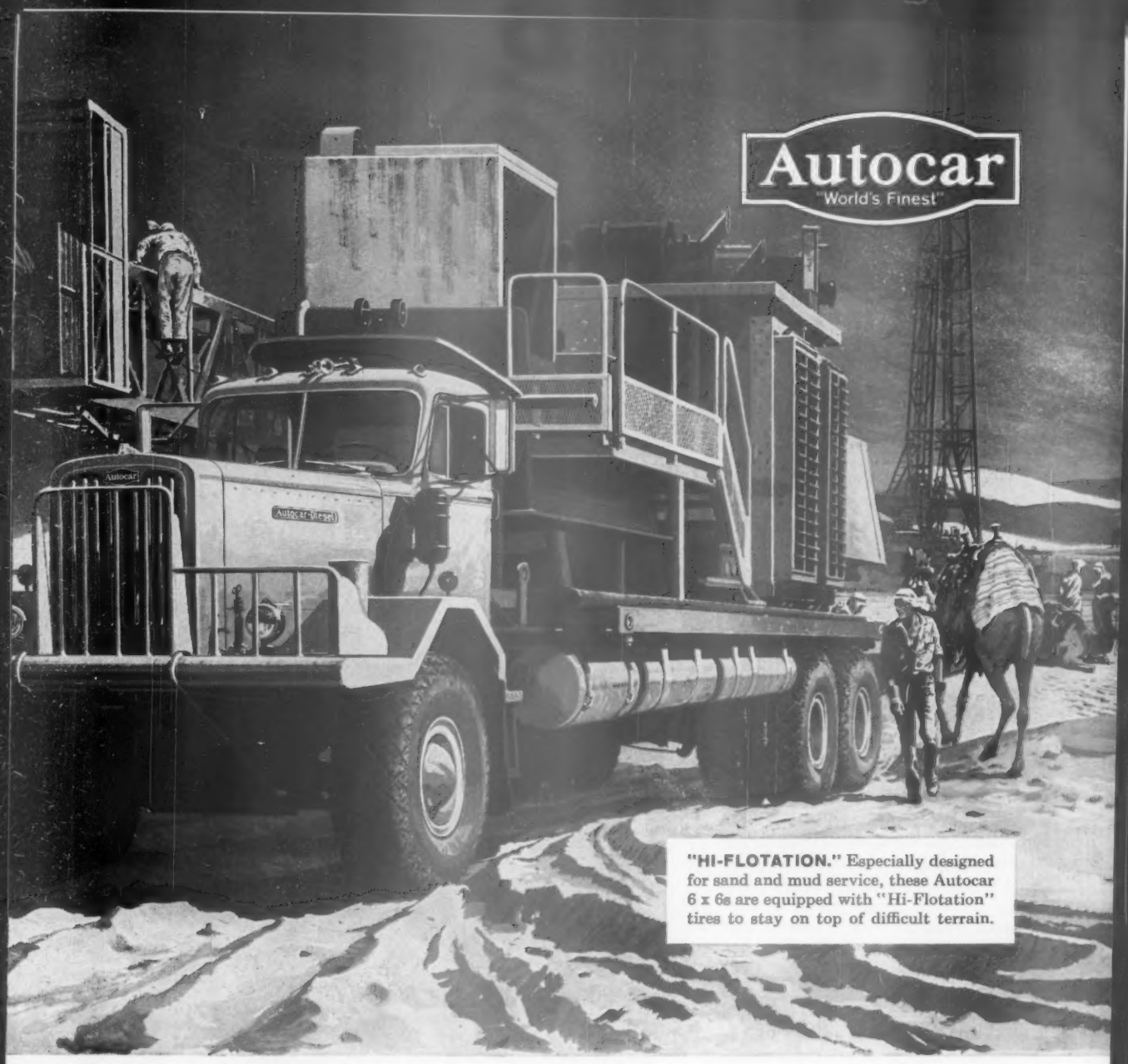
**Owner** — Union Texas Natural Gas Corporation, Houston.

**Job #1** — 10,492′ of 9⅝" casing cemented in 12¼" hole using 600 sacks UNAFLO cement plus 6% gel, followed by 200 sacks neat UNAFLO cement. Drilling mud wt. 13.5 lb/gal. Schlumberger survey temp. 168°F.; static BHT 198°F.

**Job #2** — 8⅝" hole drilled to total depth 14,625′; 4,420′ of 7" liner cemented at 14,622′ using composition of 1,670 sacks UNAFLO cement, 150 lbs. Hidense #2, 628 lbs. (.4 of 1%) HR4 by wt. of the cement. Slurry composition had density of 16.8 lbs/gal. — same as drilling mud wt. in well. Composition pilot tested before use. Schlumberger recorded circulating temp. of 256°F.; est. static temp. 302°F.

U-164

**Universal Atlas Cement**
**Division of**
**United States Steel**




**"HI-FLOTATION."** Especially designed for sand and mud service, these Autocar 6 x 6s are equipped with "Hi-Flotation" tires to stay on top of difficult terrain.

# Oil Exploring in Libya? Don't take less than Autocar

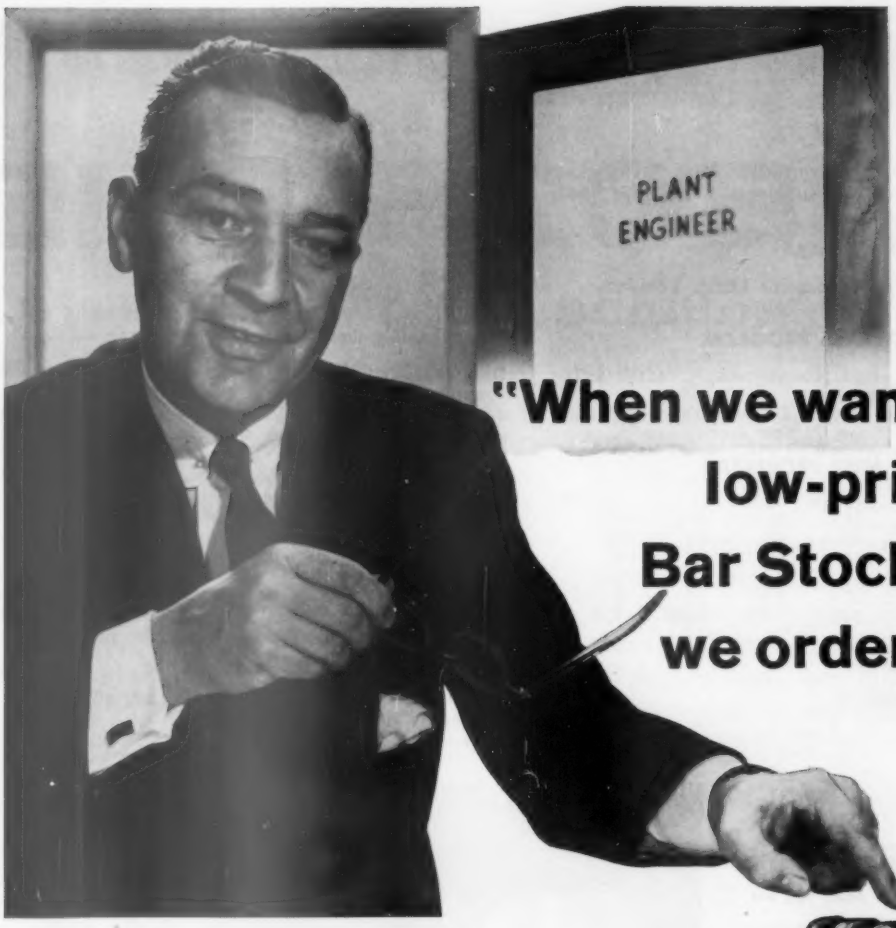
**When in Libya,** do as they do in Libya: Depend upon Autocars. They will take you over treacherous soft sand more casually than a camel, hauling heavy equipment and setting up reliable transportation.

When after oil but not in Libya, take the tip, anyway. Only Autocar fully custom-engineers a truck to meet specific operating conditions.

This Autocar is a six-wheel-drive unit with special "Hi-Flotation" tires — each one making a footprint of more than 200 square inches. It hauls draw works, pumps, derricks and power plants deep into the desert. Autocar stands up under the most grueling punishment—yet its life will be long and trouble-free. No wonder oilmen all over the world say, "Send us Autocar, nothing less."

Autocar
"World's Finest"

Division of
The White Motor Company
Exton, Pa.



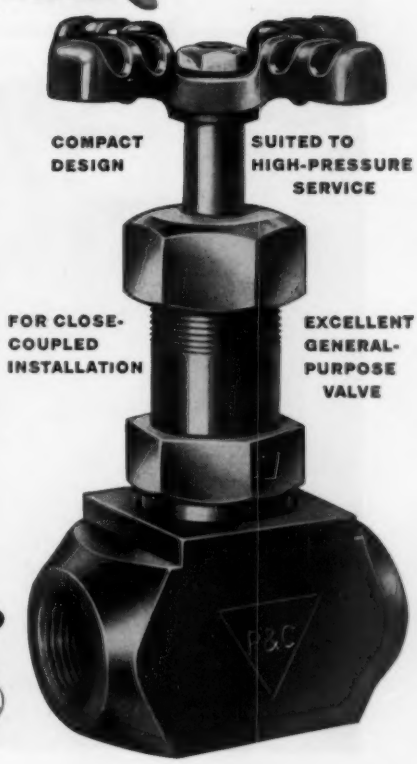

# "When we want rugged, low-priced Bar Stock Valves we order R-P&C"

"For a really versatile, **all-purpose valve**, we've found there's none better than R-P&C bar stock valves. Designed and built **for close control service**, the construction of these valves makes them well suited to many general purpose applications as well. For example, the **compactness** of R-P&C bar stock valves is particularly advantageous for close-coupled installations in instrument lines or on panel boards and for pressures up to 10,000 lbs. in steel."

These valves are available in a wide variety of materials to withstand extremely high temperatures and pressures. But best of all, R-P&C bar stock valves are economically priced. This is made possible through special techniques developed by R-P&C.

We highly recommend R-P&C bar stock valves for meter, gauge, sampling, or test valves on equipment requiring a reliable compact valve that can withstand high pressure service.

**Contact your R-P&C distributor** for full details about bar stock valves in bronze, carbon and stainless steels plus the complete line of R-P&C gate, globe and angle valves in all standard materials.




## R-P&C VALVES

ACCO

**R-P&C Valve Division, American Chain & Cable Company, Inc.**

Reading, Pa., Atlanta, Boston, Chicago, Denver, Detroit, Houston, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

*You save drilling dollars with*

# THE

**MUD PROBLEM:** Overcome pressure differential sticking (wall sticking) of drill pipe and casing.

### WELL DATA

*Location:* Lake Boeuf Field, Lafourche Parish, Louisiana
*Total Depth:* 13,685′

### MUD ADDITIVE PROGRAM

| | |
|---|---|
| 0′ to 8,000′ | Native mud plus AQUAGEL*, caustic soda and Q-BROXIN** |
| 8000′ to 13,685′ | Gyp—Q-BROXIN emulsion. TRIMULSO* and DMS† below 7″ liner depth |

### TYPICAL MUD PROPERTIES

| | | | | |
|---|---|---|---|---|
| Depth | 12,000 | 12,800 | 13,315[1] | 13,653[2] |
| Weight, ppg | 15.8 | 16.1 | 16.1 | 18.1 |
| Viscosity, sec. API | 60 | 55 | 60 | 65 |
| Plastic Viscosity, cp | 50 | 48 | 52 | 71 |
| Yield Point lb/100 sq ft | 15 | 7 | 12 | 14 |
| Filtrate, cc API | 21.8 | 2.0 | 2.2 | 0.5 |
| Calcium, ppm | 840 | 1360 | 1600 | 720 |

[1]Before addition of TRIMULSO and DMS
[2]After addition of TRIMULSO and DMS

### CASING PROGRAM

| *Size Inches O.D.* | *Depth Set Feet* |
|---|---|
| 13⅜ | 3,022 |
| 9⅝ | 10,997 |
| 7 (liner) | 13,301 |
| 5 (liner) | 13,685 |

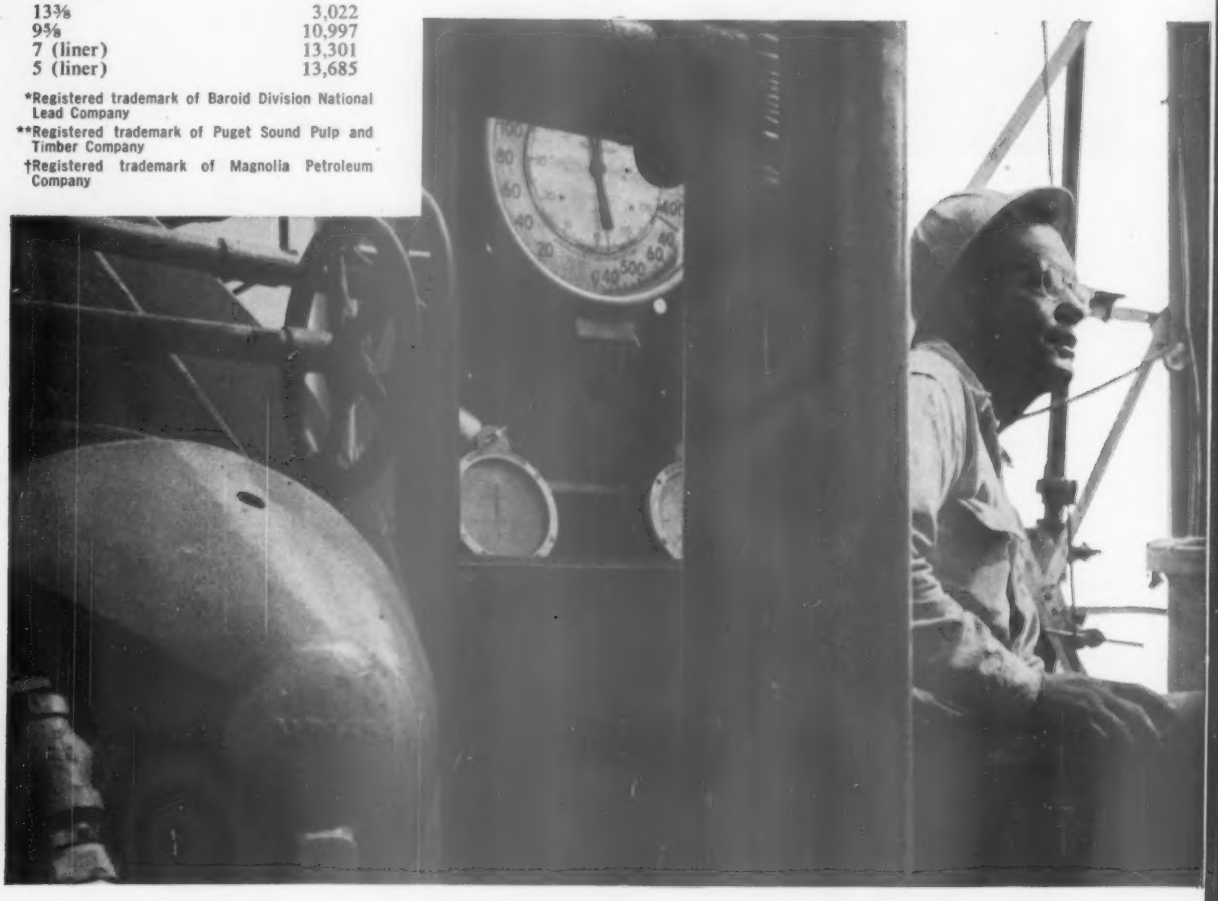
*Registered trademark of Baroid Division National Lead Company
**Registered trademark of Puget Sound Pulp and Timber Company
†Registered trademark of Magnolia Petroleum Company

**PROBLEM:** To prevent differential sticking of drill pipe. Insure landing and cementing of liner at total depth.

**DISCUSSION:** High mud weights are required to contain abnormally high formation pressures in this field. The difference between the mud column pressure and the pressure in the porous zones may cause differential sticking of drill pipe and liners. Differential sticking is evidenced by: the tendency for drill pipe to stick while making connections, running directional surveys, etc.; full circulation of the mud is possible while the pipe is stuck; and there may be no previous history of tight hole.

**SOLUTION:** Pilot tests on mud samples and previous experience with comparable jobs indicated that TRIMULSO would alleviate this troublesome condition. TRIMULSO was added to this emulsion mud while the mud weight was being increased to 18 ppg.

This well was successfully drilled to its objective without any difficulty with stuck drill pipe, and the 5″ liner was easily run and cemented.



*a Baroid Mud Program*

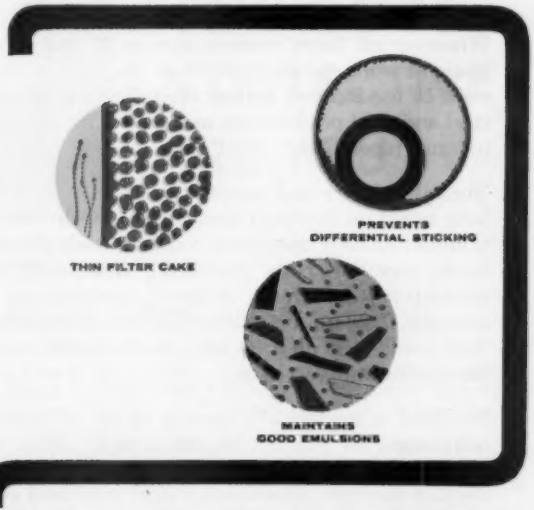
# MUD PROBLEM

## ... and its solution

This case history shows again how a complete Baroid mud program helps accomplish your drilling objective. A costly fishing operation was prevented by the use of the specific product TRIMULSO.

Baroid's previous experience enabled the diagnosis of the potentially costly fishing job that would result from differential sticking. Previous experience also resulted in prevention of the trouble by the engineered use of TRIMULSO.

This is more proof that Baroid's new concept of modern marketing brings you added advantages. You get an *integrated service* that combines engineering skills developed in all drilling areas, quality-controlled products and complete delivery service that *saves your drilling dollars!*




**BAROID**

**BAROID DIVISION NATIONAL LEAD COMPANY**

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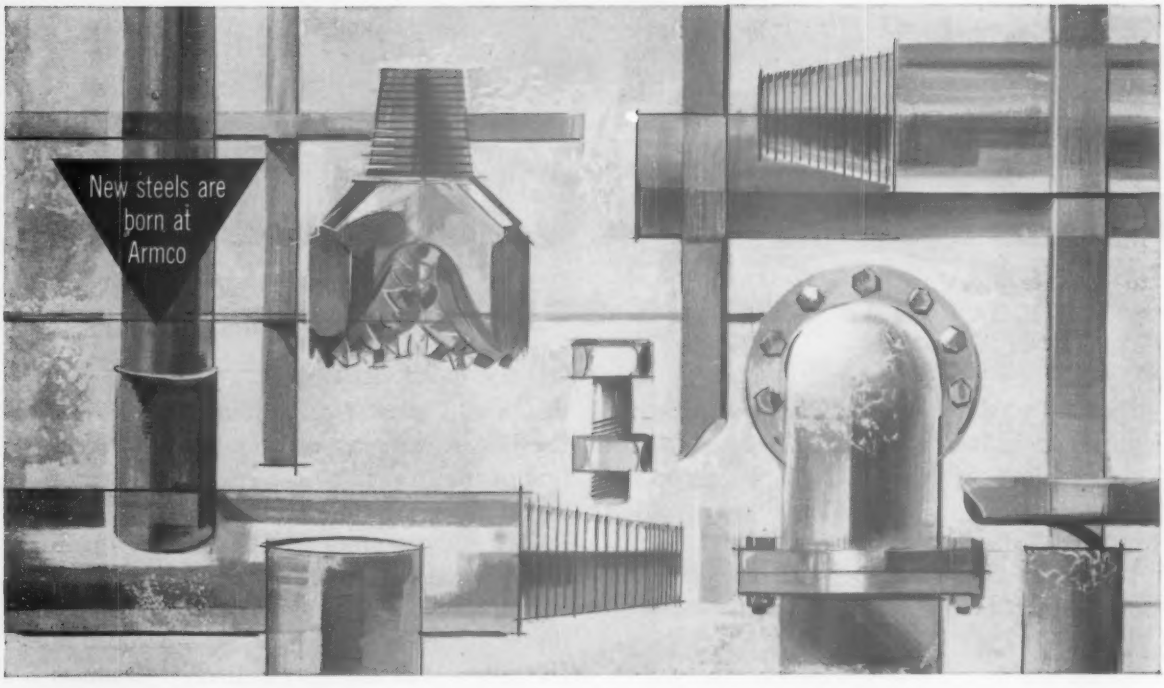


# Sheffield: the Oilman's Steelmaker

Wherever oil flows, chances are you'll find Sheffield alloy steels at work. In the drill bit at the bottom of the deepest well. In the topmost bolt of the tallest rig. Everywhere that steel and steel products are used in drilling, refining, processing and pipelining.

The oil industry and manufacturers who serve the industry have relied on Sheffield steel for several decades. Oil extraction and refining operations require a wide diversity of alloy steels, metallurgically "tailored" to different needs—high strength-to-weight ratio—different combinations of hardness, strength, toughness, machinability and other properties. Sheffield meets them all, with alloy steels quality-controlled from furnace to shipping dock.

Sheffield is strategically located in the oil country. Freight advantages for you can be considerable. Time saved can be important. And Sheffield has the know-how to help you determine the right alloy steel to meet your need at lowest cost. For the whole story, get in touch with our technical staff at Houston, Texas.

**SHEFFIELD**

ARMCO

**Quality Steels for the Oil Industry**

Finished Bolt products. Alloy and carbon steels for tank-heads, drill collars, rock bits, casings, drill stems, rig equipment, refinery and pipeline equipment. Many other oil industry needs.

## SHEFFIELD DIVISION

*Sheffield Plants In Kansas City, Tulsa and Houston*

ARMCO

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Sylvester W. Alden

**Sylvester W. Alden** spends a lot of time outdoors during working hours. Boating and fishing, however, are only his favorite sports, not his occupation. He also is president of the Savanna, Illinois, school board.

Robert J. Sincock

**Robert J. Sincock** is City Commissioner of Plymouth, Michigan, and is mayor pro tem. He owns and operates a successful business during his working hours. He also is program chairman of the Rotary Club.

Harold L. Schaller

**Harold L. Schaller** is active in civic affairs. He is a member of the Traffic Safety Commission of Cudahy, Wisconsin. Formerly he was chairman of the Lake school board and a member of the Fire and Police Commission of the town of Lake, now a part of Cudahy.

# HOW GOOD A DETECTIVE ARE YOU?

## Using the clues on this page, can you guess the occupation of these men?

Have you ever felt that you might have made a good detective—perhaps even better than the "private eyes" on television? Here is your chance to prove it. See whether you can discover the true occupation of the men in the pictures. These men are all in the same line of work.

*Clue number one: Signatures.* Are you a judge of handwriting? Do the signatures reveal executive traits? Manual skills? Independent minds?

*Clue number two: Civic activities.* All the men play prominent roles in community affairs. They are interested in people, like to deal with them. And, because they are civic *leaders*, you can assume they have a very good stake in their communities. A financial stake, perhaps?

*Clue number three: General appearance.* They have the independent air of men who can stand on their own feet, manage their own affairs. They also spend time outdoors, yet seem to feel at home doing office work.

Put these clues together and you find men who are: independent, practical, probably own their own business, like to deal with people, work indoors as well as outdoors.

By now you've probably solved the case. They are all Standard Oil dealers. Typical of the some 15,000 dealers, they own their businesses. They have based their futures on association with a company that stresses product quality.

When they are not on the job, they give much time and talent to civic and human welfare activities. As participants in local government, chambers of commerce, school boards, scouting and other youth work, they lead full, active lives devoted to the service of others.

**WHAT MAKES A COMPANY A GOOD CITIZEN?** A good citizen is one who works for the good of all. By working in harmony with small businesses and making it possible for them to grow and prosper, Standard hopes to contribute to the well-being and general welfare of many communities. We are proud that so many of our dealers and employees are successful both in business and civic life.

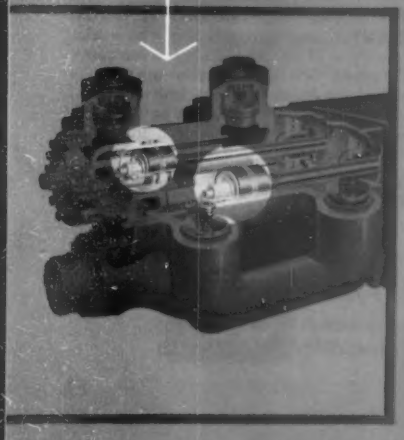
STANDARD

**STANDARD OIL COMPANY**
**(INDIANA)**

THE SIGN OF PROGRESS...
THROUGH RESEARCH

# the name Mission here

## is your guarantee of real savings here



Take a good look at this Mission piston. Mission was first with this design, although today you'll see other pistons made to look like it. You see, the engineering advances that have gone into Mission pistons have made them the standard by which all others are judged.

Replaceable rubbers, long-life rubber compounds, special fabric backing, one-piece forged steel bodies, hardened piston flanges, close tolerances, wear groove in piston body flanges, API taper for piston bore, and easy and reliable snap rings and end plates are some of the specific reasons Mission pistons are superior.

The unique Mission guarantee, that Mission products will outperform any other products, is the big reason that removes all chance. You get the best only from Mission; so get only Mission—genuine Mission with the name on them—pistons. Play it safe!

MISSION MANUFACTURING CO.

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# They Say—

## Pumping from way down

Dear Sir:

I enjoyed very much your article on the West Bisti Gallup Sand Unit (OGJ, July 11, p. 106).

In that article you make a statement to the effect that a 59-stage turbine pump set at 1,049 ft. was the deepest setting for a pump of that type.

If my memory serves me well, Humble Oil & Refining Co., Carter division, set a Peerless 40-stage pump at 1,210 ft. in the Katie Third Deese Sand Unit in Garvin County, Oklahoma, in August 1958. The pump output has been running around 10,000 bbl. a day.

S. J. Schedler
Humble Oil & Refining Co.
Durango, Colo.

*(Editor's note: Reader Schedler is correct. Actually, Peerless Pump has made 40 to 50 settings below 1,200 ft. since 1953, deepest being around 1,500 ft.)*

## That Mile a Day

Dear Sir:

Thank you very much for the advance copy of the article on "... How to Drill a Mile a Day..." (OGJ, July 18, p. 66).

All of the Dixie Drilling Co. organization appreciate very much your interest, and we are most delighted in the fine manner in which this article was put together. You haven't missed a trick! It is certainly a job well done.

H. W. Klein
President
Dixie Drilling Co., Inc.

## Society to tour quake area

Dear Sir:

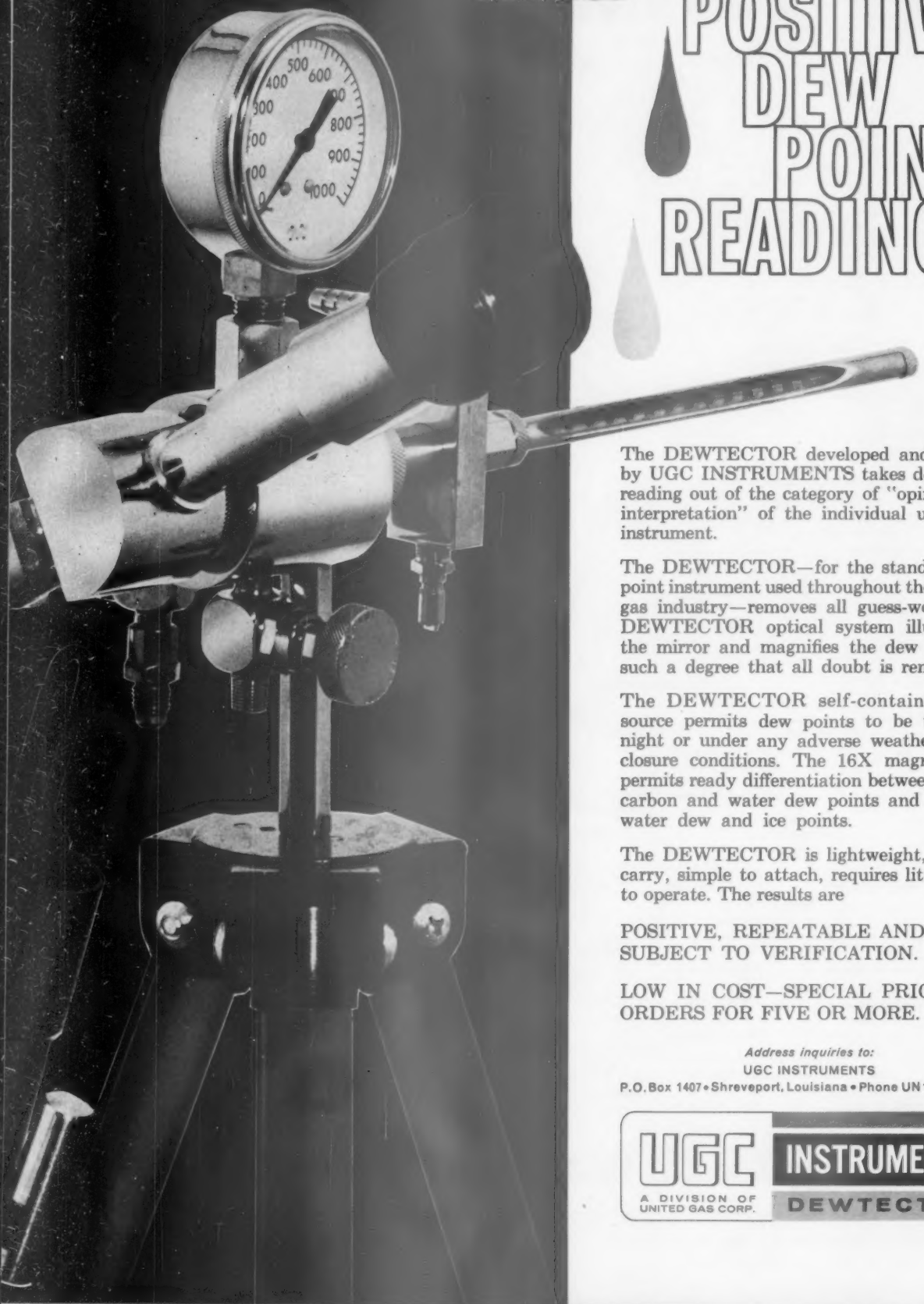
Enclosed is a copy of the Billings Geological Society's announcement of the eleventh annual field conference (Sept. 7-10 trip to Hebgen Lake-Madison Valley area of southwestern Montana).

Several things about our conference are unique, I believe. First, the area is one of immense recent geologic and tourist interest; over 30,000 people have visited the area already this summer.

Second, the area is of great scientific interest and provides a dramatic

AT LAST YOU CAN BE SURE OF

# POSITIVE DEW POINT READINGS



The DEWTECTOR developed and proved by UGC INSTRUMENTS takes dew point reading out of the category of "opinion and interpretation" of the individual using the instrument.

The DEWTECTOR—for the standard dew point instrument used throughout the natural gas industry—removes all guess-work. The DEWTECTOR optical system illuminates the mirror and magnifies the dew point to such a degree that all doubt is removed.

The DEWTECTOR self-contained light source permits dew points to be taken at night or under any adverse weather or enclosure conditions. The 16X magnification permits ready differentiation between hydrocarbon and water dew points and between water dew and ice points.

The DEWTECTOR is lightweight, easy to carry, simple to attach, requires little effort to operate. The results are

POSITIVE, REPEATABLE AND SUBJECT TO VERIFICATION.

LOW IN COST—SPECIAL PRICES ON ORDERS FOR FIVE OR MORE.

*Address inquiries to:*
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UGC
A DIVISION OF UNITED GAS CORP.
INSTRUMENTS
DEWTECTOR

example of mountain-building and earth-shaping processes.

Third, although many people will not realize such, the geologic features and happenings visible to the working geologist make one acutely aware of the complexity of earth movements and related tectonics; all of much importance to petroleum geologists.

Fourth, a great deal of stratigraphy and structure is visible in the adjacent area (Gravelly Range) and will be completely covered in our guidebook.

The society's guidebook covering the area is not going to be "sensationalism." We felt, when first embarking on this endeavor, that as the area will be one of major geologic and general interest for decades, the society could make a substantial contribution by gathering and publishing tectonic and structural articles, personal accounts, stratigraphic, paleontologic and geomorphologic papers on the general area while the locality is still fresh in people's minds.

In view of the above, I sincerely believe the members of the society are doing a needed and most worthwhile job and fine public service.

No doubt you can surmise that we are quite enthused about the whole thing.

J. H. Clement
President
Billings, Mont., Geological Society

## Grounds for pessimism

"Past experience with rough handling over the tidelands question is grounds for pessimism about the treatment the oil industry can expect until a final decision is reached.

"In the election years of 1948 and 1952, oil companies, whose operations in the gulf were brought to virtual standstill by the legal scramble, were cast in the role of villains, 'commanding Congress' to give title to the states, trying as the late Harold Ickes put it, 'to get away with murder.'

"While oil men might have questioned on moral grounds the suddenness of the federal Government's interest in tidelands ownership, expressed only after oil had been found, for them the matter of who owns submerged coastal lands is not important. Regardless of who has jurisdiction, there is no 'giveaway.' The plain fact is that bonus, royalty, premium, and tax payments there go on just the same.

"In the past 15 years, oil companies have paid more than $750 million for lease bonuses in the gulf alone. The only question of real interest to the industry is, 'Who is the landlord to whom we pay the rent?'

"The Supreme Court's decision may

LONGER valve life, less maintenance and process interruption, positive closure, easier operation, self-adjustment for valve body deflection. These are some of the well proved advantages gained as a result of the Darling *fully revolving double disc parallel seat* principle!

These Darling valves are made in various alloys, types and sizes for most services . . . and for all pressures. Send for Catalog No. 57. You'll see what we mean by exceptional performance.

**ENGINEERING SERVICE:** Darling offers unusual facilities for the development and manufacture of special valves for out-of-the-ordinary requirements. This special service is available to you at all times, without obligation.

**DARLING VALVE & MANUFACTURING CO.**
Williamsport 1, Pa.
*Manufactured in Canada by*
*Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ont.*

WITH NEW GENERAL ELECTRIC **SOLID-STATE** EQUIPMENT . . .

# You Achieve Greater Supervisory System Reliability

**No moving parts, no adjustments to make**—that's why you receive greater system reliability from General Electric solid-state supervisory equipment with transistorized logic elements. With these rugged new elements, which are computer-designed and factory pretested to eliminate any chance of human error, you are assured of virtually fool-proof operation.

The new solid-state plug-in logic elements eliminate malfunctions due to contact failure because there are no moving contacts. Switching and coding functions are accomplished by transistors and diodes.

**For added dependability** the solid-state unit uses a self-contained 12-volt power supply and regulator. Shock hazard in the solid-state unit is virtually eliminated, and you need no external battery supply. Transistorized elements are protected from accidental overvoltage, too.

All external connections to the unit are isolated electrically so that overvoltage trips out the external circuit before the transistors are affected. Protective isolation is one more feature that assures you of system reliability.

New General Electric solid-state supervisory equipment retains the proven space-code-selector type of operation. This space-code system, developed by General Electric, has demonstrated its superiority in over 16 years of successful operation.

Get all the facts. Contact your nearest G-E Apparatus Sales Office, or write for bulletin GEA-7043, General Electric Co., Schenectady 5, N. Y. 513-10

*Progress Is Our Most Important Product*

GENERAL ELECTRIC

have brought the final answer a little closer, but until there is no longer any question at all, the industry will do well to be vigilant against the kind of 'steal'—'giveaway'—'windfall' propaganda charges which always seem to accompany any action on submerged lands."

*Editorial in Our Sun, magazine of Sun Oil Co.*

**Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.**

# CALENDAR

**AUGUST**

- 3-5 Wyoming Geological Association, field trip to Snyder basin and Wind River Mountains, Casper.
- 14-19 National Congress of Petroleum Retailers, Inc., annual session, Shamrock-Hilton Hotel, Houston.
- 15-16 North Dakota Oil and Gas Association, annual meeting, Grand Pacific Hotel, Bismarck.
- 15-17 American Society of Mechanical Engineers, American Institute of Chemical Engineers, heat transfer conference and exhibit, Statler Hilton Hotel, Buffalo, N. Y.
- 15-26 Sacramento State College, summer institute on nondestructive testing, Sacramento, Calif.
- 19 Southern Gas Association, roundtable conference on pipeline engineering, Mayo Hotel, Tulsa.
- 22-26 Gordon Research Conference, catalysis, Colby Junior College, New London, N. H.
- 29-31 Appalachian Gas Measurement Short Course, University of West Virginia, Morgantown, W. Va.
- 30-Sept. 2 American Association for the Advancement of Science, Alaska Division, eleventh Alaskan science conference, Anchorage.

**SEPTEMBER**

- 6-7 Chemical Institute of Canada, organic chemistry division conference, Edmonton.
- 7-9 American Society of Mechanical Engineers, joint automatic control conference, Massachusetts Institute of Technology, Cambridge, Mass.
- 7-10 Billings Geological Society, annual field trip, Hebgen Lake-Madison Valley area of southwestern Montana.
- 8-9 National Research Council, Chemical Institute of Canada, tenth Canadian high polymer forum, Alpine Inn, Montreal.
- 8-9 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, annual meeting, Roosevelt Hotel, New Orleans.
- 8-10 Chemical Institute of Canada, western regional conference, Regina.
- 8-10 Intermountain Association of Petroleum Geologists and Eastern Nevada Geological Society, field trip, economic geology of east-central Nevada.
- 11-13 New Mexico Petroleum Industries Committee, annual convention, Western Skies Hotel, Albuquerque.
- 11-16 American Chemical Society, national meeting, New York City.
- 14-15 Western Petroleum Refiners Association, Rocky Mountain regional tech-


2

REASONS WHY YOU GET MORE WITH A

HARBISON-FISCHER

Double-Displacement® PAT. ROD PUMP

When a conventional rod pump will no longer produce enough fluid to make the oil allowable, many operators save money by running a Harbison-Fischer Double-Displacement® Rod Pump instead of installing a tubing pump.

The pump is especially efficient where it is desired to lift a greater volume of fluid in order to increase daily oil production. The Double-Displacement has all the production advantages of a full-volume tubing pump, plus the operating advantages of an insert pump that can be run and pulled on the rods.

The pump is also often run when it is desired to produce the same volume of fluid, but at slower pumping rates. By operating old or aging pumping units at slower speeds their service life can be increased, and maintenance costs will be decreased.

The Double-Displacement is a traveling barrel, bottom hold-down assembly with two plungers and two barrel tubes which work simultaneously with a single set of valves. Pumps are available in a wide range of metal-to-metal, H-F Flexite®, or soft packing plungers, with chrome-plated or heat-treated barrel tubes in 2″ x 1½″, 2½″ x 2″, and 3″ x 2½″ sizes.

One installation will convince you that a Double-Displacement Rod Pump is the "Best Pump in the Oil Patch"® for large-volume production. You can obtain full details, illustrated literature, and comparative production data without obligation from your store, one of our many factory representatives, or by writing us at Box 2477, Fort Worth.

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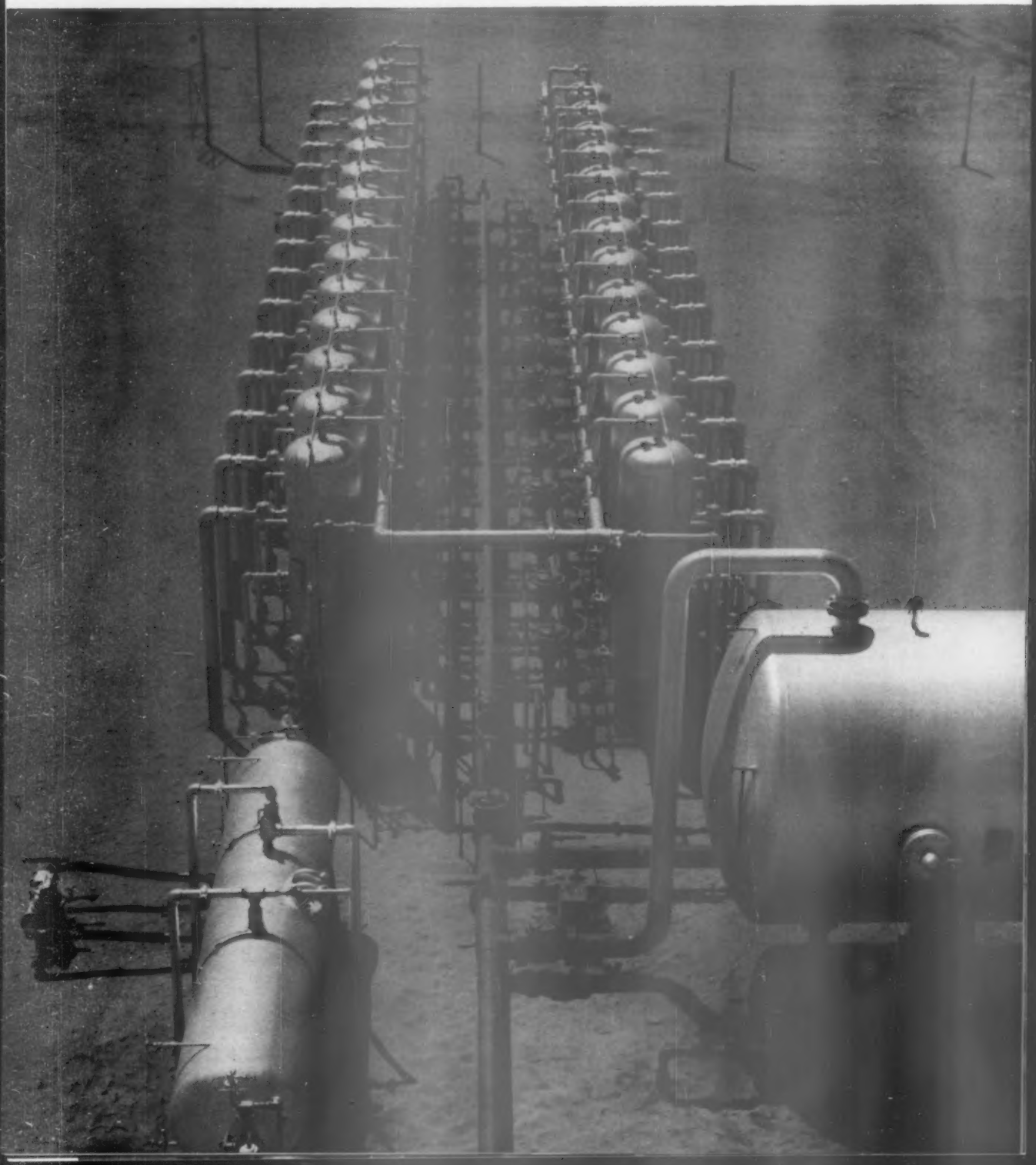
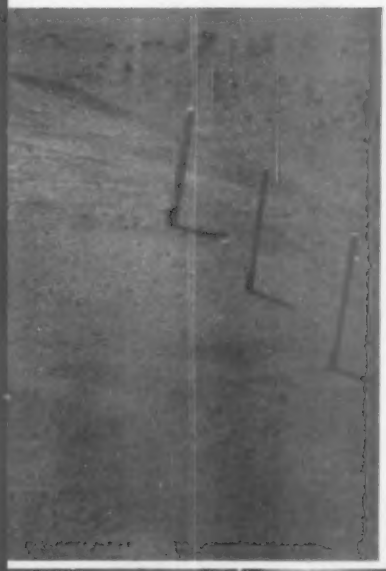
HARBISON-FISCHER MFG. CO., FORT WORTH

# automatic – economical
# it's Foxboro Gas-Oil



# – maintenance-free . . .
# Separator Control



Three simple, low-maintenance Foxboro instruments — that's all you need in Foxboro's automatic oil-gas separator control system.

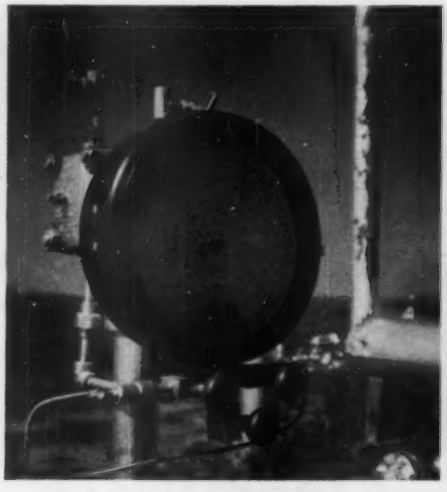
1. The Foxboro d/p cell* controller to regulate tank level and, where desired, provide automatic emergency shut-off of incoming production
2. The Foxboro M/41A Controller to maintain constant, even back-pressure in the separator
3. The Foxboro T/37 Diaphragm Meter for accurate indicating measurement of gas flow leaving the separator

Three, simple, low-cost, low-maintenance instruments to control the whole separation process — economically, automatically.

Ideal for a single separator, or for a whole battery of them. Ask your nearby Foxboro Field Engineer for details. Or write for Bulletin 1-28. The Foxboro Company, 608 Neponset Avenue, Foxboro, Massachusetts.

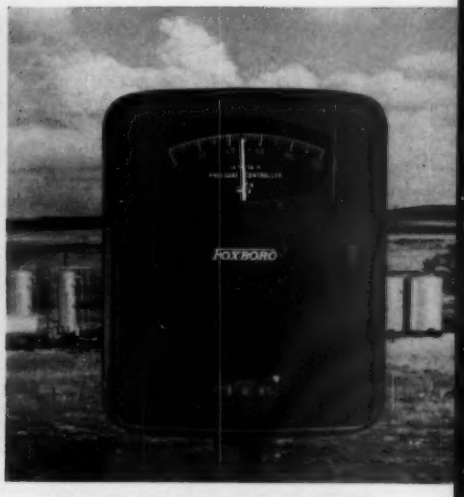
**For Oil Level Control . . .**

d/p cell measures change in separator level and operates Foxboro control valve in oil draw-off line. When valve is equipped with Foxboro Valvactor* positioner oil in separator can be controlled through any desired range of level.



**For Gas Flow Measurement . . .**

the Foxboro T/37 Diaphragm Meter. Keeps accurate chart record of gas flow leaving separator. Meter uses no mercury — cannot be damaged by overrange. Simple, rugged, responsive — it seldom requires maintenance of any type.




**For Back-Pressure Control . . .**

the Foxboro M/41A indicating controller. Maintains close control of pressure in separator by operating Foxboro Stabilflo* control valve in output line. Smooth, even gas flow is assured. Separator back-pressure may be easily preset from index pointer on controller.

*Reg. U. S. Pat. Off.*

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REG. U. S. PAT. OFF.

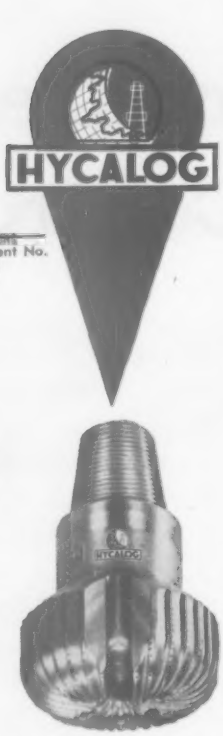
*and now patented*

*Developed by Hycalog . . .*

# V-DOOR DRILL BITS

Patent Pending U. S. Patent No. 2,931,630

# CORE AND BUST TO ACHIEVE LONG UNINTERRUPTED RUNS

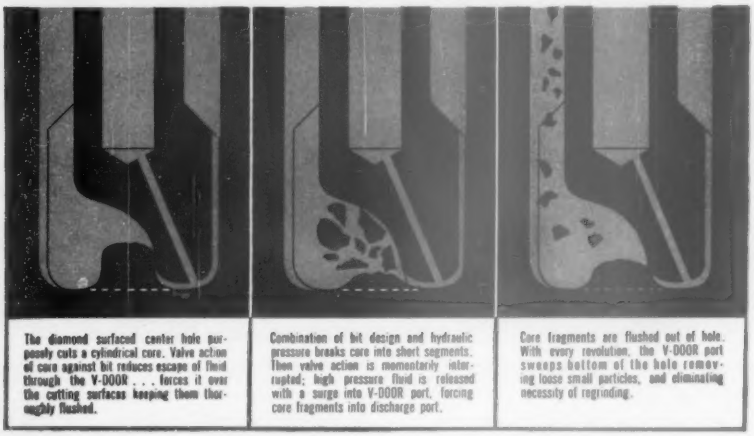



**Diamond drill bits** were formerly handicapped in duration of runs . . . *and rate of penetration* . . . by their inability to dispose of cores formed at their centers.

In shales and other soft formations, the core twisted off and rotated with the bit.

In hard sands the core crushed the center diamonds, preventing further drilling.

BUT HYCALOG'S ENGINEERS have turned these handicaps into an advantage. Now, the V-DOOR bit, developed by HYCALOG, utilizes *controlled failing* of cores to achieve a faster rate of penetration . . . *and longer life.* HERE'S HOW:



The diamond surfaced center hole purposely cuts a cylindrical core. Valve action of core against bit reduces escape of fluid through the V-DOOR . . . forces it over the cutting surfaces keeping them thoroughly flushed.

Combination of bit design and hydraulic pressure breaks core into short segments. Then valve action is momentarily interrupted; high pressure fluid is released with a surge into V-DOOR port, forcing core fragments into discharge port.

Core fragments are flushed out of hole. With every revolution, the V-DOOR port sweeps bottom of the hole removing loose small particles, and eliminating necessity of regrinding.

Ask your HYCALOG rep to show you some performance records on the V-DOOR. He has a stack of them. *And also get the facts on* HYCALOG *well logging.*

**Hycalog, Inc.**

505 AERO DRIVE

SHREVEPORT, LOUISIANA

BRANCH OFFICES IN PRINCIPAL OIL PRODUCING AREAS

DIAMOND CORING • DIAMOND BITS • WELL LOGGING • CORE ANALYSIS


nical-industrial relations meeting, Henning Hotel, Casper, Wyo.

14-16 National Industrial Conference Board, eighth annual marketing conference, Waldorf-Astoria Hotel, New York.

14-16 National Petroleum Association, annual meeting, Traymore Hotel, Atlantic City, N. J.

15 Natural Gasoline Association of America, Rocky Mountain regional meeting, Palliser Hotel, Calgary.

15-16 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual engineering management conference, Morrison Hotel, Chicago.

16-17 Kansas Geological Society, twenty-fifth annual field conference, northeastern Oklahoma, Western Hills Lodge, Wagoner, Okla.

18-21 American Society of Mechanical Engineers, petroleum mechanical engineering conference, Jung Hotel, New Orleans.

19-21 Texas Mid-Continent Oil and Gas Association, annual meeting, Hilton Hotel, San Antonio, Tex.

21-23 Pacific Coast Gas Association, annual meeting, Westward Ho Hotel, Phoenix.

25-27 American Association of Oilwell Drilling Contractors, annual meeting, Roosevelt Hotel, New Orleans.

25-28 American Institute of Chemical Engineers, meeting, Mayo Hotel, Tulsa.

25-28 American Institute of Electrical Engineers, petroleum industry committee, electrical conference of the petroleum industry, Hotel Skirvin, Oklahoma City.

26-29 American Welding Society, fall meeting, Penn-Sheraton Hotel, Pittsburgh.

26-30 Instrument Society of America, instrument-automation conference and exhibit, and fifteenth annual meeting, Coliseum, New York.

27-29 Mid-West Gas Association, annual school and conference, Memorial Union, Iowa State College, Ames.

29-30 Mid-Continent Oil and Gas Association, Mississippi-Alabama division meeting, Grand Hotel, Point Clear, Ala.

29-Oct. 1 West Texas Geological Society, field trip, Delaware Basin of West Texas and southeast New Mexico.

**OCTOBER**

2-5 Society of Petroleum Engineers of AIME, annual fall meeting, Denver.

3-4 Independent Natural Gas Association of America, annual meeting, Fontainebleau Hotel, Miami Beach.

4-5 University of Kansas, gas-measurement institute, National Guard Armory, Liberal, Kans.

6-7 National Association of Corrosion Engineers, annual western region conference, Sheraton-Palace Hotel, San Francisco.

6-8 National Association of Corrosion Engineers, southeast region conference, Dinkler-Plaza Hotel, Atlanta, Ga.

6-8 National Academy of Sciences, National Research Council. ninth national clay conference, Purdue University, Lafayette, Ind.

10-12 American Gas Association, annual convention, Atlantic City.

11-14 National Association of Corrosion Engineers, northeast region conference, Prichard Hotel, Huntington, W. Va.

12-14 Southwestern Federation of Geological Societies, annual meeting, Wooten Hotel, Abilene, Tex.

13-14 California Natural Gasoline Associa-

# Naugatuck PARACRIL OZO

THE OIL-RESISTANT, OZONE-RESISTANT NITRILE RUBBER

## Great new advance in hose rubber

New PARACRIL OZO—exciting development from the laboratories of Naugatuck Chemical—offers the makers and users of rubber hose a combination of properties never before available.

Hose of every description, for practically every purpose, can be tougher, less bothered by abrasion, more oil and weather resistant than ever before. *And it can be produced in any permanent color desired!*

New PARACRIL OZO offers such advantages as:

- significantly superior ozone resistance
- excellent fuel and oil resistance
- several times greater abrasion resistance
- permanent retention of bright, uniform colors

Discover first hand the dramatic new sales possibilities this proven new rubber offers you. In increased product quality. In new production economy. For full information and whatever technical assistance you may require, contact your Naugatuck representative or write the address below today.

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**Division of United States Rubber Company** Dept. A Elm Street Naugatuck, Connecticut

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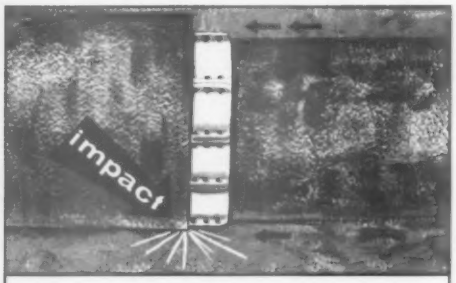
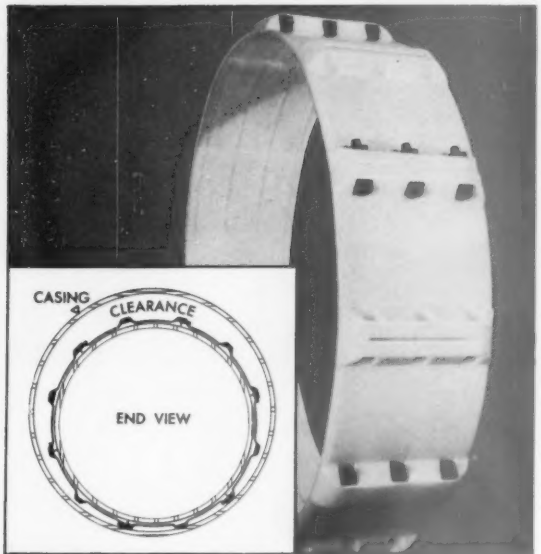
# NEWS FROM DOWN THE LINE!

## WmSON BIG-INCH M-2 THINSULATORS® MEET RUGGED TEST IN NEW JERSEY TURNPIKE CROSSING

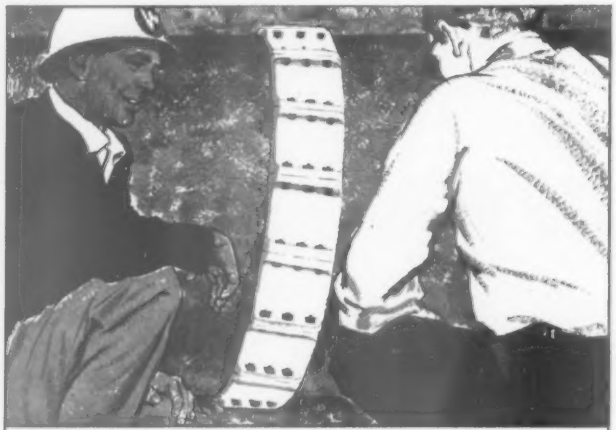
❶ "We'll pull the 36" drag section through this 275' casing. The casing has a slight dog-leg in the center which will make the pull a really tough test of the THINsulators."




❷ "M-2 THINsulators are high-density polyethylene products, resistant to fracture under tremendous impact. Most other plastic insulators are fiberglas reinforced polyesters that don't have the impact resistance, so breakage rates are high."




❸ "The high density polyethylene gives the M-2 such strength it can be made more compact than other insulators, allowing more clearance. It's flexible, so it conforms to the pipe for uniform coating loading . . . and the low coefficient of friction makes it slide like it's greased."



❹ "The tremendous force of the pull caused the lead THINsulator to absorb most of the shock. It twisted slightly but remained intact. All hands agree this is the best plastic casing insulation they have used."

❺ "Consider the economy of M-2 THINsulators. They cost no more than other plastic insulators, and breakage is **practically unknown.** Bend 'em, beat 'em, you can't break 'em."

**T.D. Williamson, Inc.**

P. O. BOX 40 • TULSA 2, OKLAHOMA

REPRESENTATIVES AROUND THE WORLD

Write Dept. A for Technical Bulletin on the M-2 THINsulator

tion, annual fall meeting, Hotel Miramar, Santa Monica, Calif.

13-16 Taft, Calif., Oildorado, fiftieth anniversary celebration.

14-16 New Mexico Geological Society, annual field conference, Chama basin of northern New Mexico, registration, Taos, Oct. 13.

17-19 American Society of Mechanical Engineers, American Society of Lubrication Engineers, lubrication conference, Statler Hilton Hotel, Boston.

17-19 University of Minnesota, Pennsylvania State University, Colorado School of Mines, biannual symposium on drilling and blasting, Golden, Colo.

19-20 National Association of Corrosion Engineers, north central region conference, Schroeder Hotel, Milwaukee.

19-21 Gulf Coast Association of Geological Societies, convention, Biloxi, Miss.

19-21 Rocky Mountain Oil and Gas Association, annual convention, Brown Palace Hotel, Denver.

20-21 American Institute of Mining, Metallurgical, and Petroleum Engineers, Los Angeles Basin, fall meeting, Huntington Sheraton Hotel, Pasadena, Calif.

20-23 Odessa Oil Show, Odessa, Tex.

23-25 Independent Petroleum Association of America, annual meeting, Statler-Hilton Hotel, Dallas.

24-25 American Society of Mechanical Engineers, American Institute of Electrical Engineers, fuels conference, Daniel Boone Hotel, Charleston, W. Va.

25-28 National Association of Corrosion Engineers, south central region conference, Mayo Hotel, Tulsa.

26-27 Armour Research Foundation of Illinois Institute of Technology, computer applications symposium, Morrison Hotel, Chicago.

26-27 Western Petroleum Refiners Association, annual question and answer session on refining technology, Rufus Garrett Hotel, El Dorado, Ark.

28 Natural Gasoline Association of America, southern regional meeting, Carlton Hotel, Tyler, Tex.

NOVEMBER

3-4 American Association of Petroleum Geologists, Pacific section, annual meeting, Ambassador Hotel, Los Angeles.

3-4 Society of Automotive Engineers, national fuels and lubricants meeting, Mayo Hotel, Tulsa.

6-9 Chemical Institute of Canada, chemical engineering division, conference, Quebec City.

7-10 Society of Exploration Geophysicists, international meeting, Moody Convention Center, Galveston, Tex.

14-16 American Petroleum Institute, fortieth annual meeting, Conrad Hilton, Palmer House and Congress hotels, Chicago.

15-16 University of Kansas, natural-gas pipeline institute, Courthouse, Liberal, Kans.

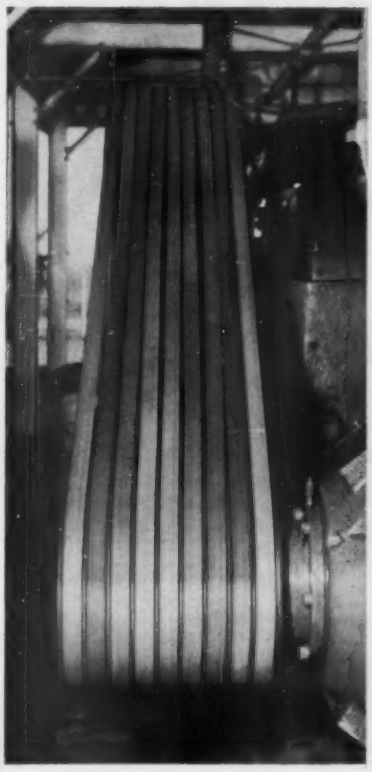
15-17 Southwest Research Institute, Air Force, Navy, industry propulsion systems lubricants conference, Hilton Hotel, San Antonio, Tex.

18 Natural Gasoline Association of America, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.

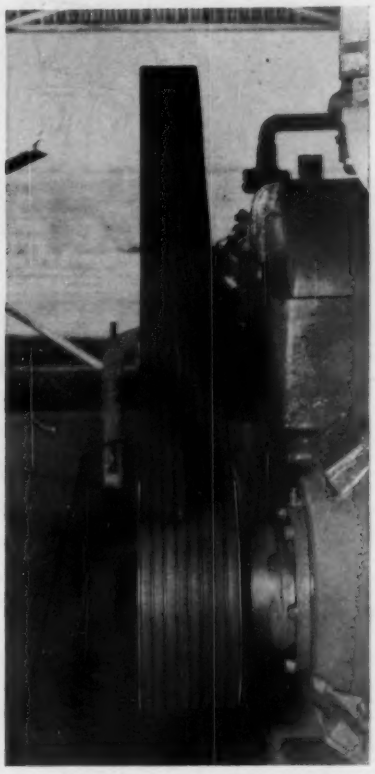
27-Dec. 2 American Society of Mechanical Engineers, winter annual meeting, Statler Hilton Hotel, New York.


# SAME JOB

**Fewer Belts . . . Narrower Sheaves**
**Less Bearing Load . . . Lower Costs**



Conventional V-Belt Drive



Thermoid-Quaker "Powerflex Wedge" V-belt drive

## Quaker Thermoid "POWERFLEX WEDGE" V-BELTS SAVED $402 ON THIS JOB

The shape of new "Powerflex Wedge" V-belts is narrower with added depth . . . for a big jump in "pulling" power. More pull means fewer belts, smaller sheaves, shorter centers and less bearing load; *more efficient power transmission.* Costs on this documented "Powerflex Wedge" installation amounted to a savings of $402.14 over the conventional V-belt drive.

But design isn't the whole story! New Thermoid-Quaker rubber compounds and tougher, load-carrying cords play a vital role in prolonging belt wear . . . for even greater savings.

Check "Powerflex Wedge" V-belts for better power transmission. Your Thermoid Division Distributor is there to serve you. *Thermoid Division, H. K. Porter Company, Inc., 200 Whitehead Road, Trenton 6, N.J.*

**THERMOID PORTER DIVISION**

**H. K. PORTER COMPANY, INC.**

**PORTER SERVES INDUSTRY** with steel, rubber and friction products, asbestos textiles, high voltage electrical equipment, electrical wire and cable, wiring systems, motors, fans, blowers, specialty alloys, paints, refractories, tools, forgings and pipe fittings, roll formings and stampings, wire rope and strand.

# FOR MAXIMUM SERVICE SPECIFY

## B&W *Job-Matched seamless pressure tubing*

**B&W offers you . . .**

- sound engineering assistance on tubing end-use and fabricating requirements
- mutual understanding toward achieving the most satisfactory and economical tube performance
- the extensive facilities of 2 tube mills—plus a nationwide network of district sales offices and steel service centers manned by *experienced* tube salesmen—equipped to serve you with efficiency and dispatch

These are just a few of the many reasons why it pays to specify B&W Carbon or Alloy Seamless Pressure Tubing or Pipe. And remember—matching tubes to jobs assures you the *right tube*, in the *right quantity*, at the *right time*. For more information, call your local B&W District Sales Office, or write for Bulletin TB-417. The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pennsylvania.

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B&W THE BABCOCK & WILCOX COMPANY
TUBULAR PRODUCTS DIVISION

Seamless and welded tubular products, solid extrusions, seamless welding fittings and forged steel flanges—in carbon, alloy and stainless steels and special metals

the Journal said...

## 50 years ago

August 4, 1910

American oil men are expressing interest in a new method of lifting oil devised by an Austrian engineer and being adopted in fields of Galicia. It consists of an endless band of ordinary flat hempen rope or cable faced with carpet shag or pile to increase its absorbent capacity. The absorbent band, lowered into the well over a rotating drum, soaks up the oil, which is squeezed out by passing the band through pressing or mangling rollers.

Uneasiness felt for sometime by Oklahoma and eastern oil producers over the large flush production which has been building up in the new Caddo field of northwestern Louisiana began to dissipate last week. A week's completions of relatively small wells marked a break in the succession of 10,000 to 20,000-bbl. per day gushers which have been threatening a market-breaking oil flood. Daily average production also declined for the first time.

## 25 years ago

August 1, 1935

Flaring of sweet gas from wells and gasoline plants in Texas halts as the newly enacted state gas conservation law goes into effect August 1. In Texas Panhandle alone, waste of more than 1 billion cubic feet of gas daily ends. Action curtails operation of Panhandle gasoline plants, cutting output 260,000 gal. daily.

California oil operators form Pacific Petroleum Association in emergency move to carry out a new unanimously adopted voluntary proration plan for greater stabilization in the industry. The plan, calling for fixing the state's production at consumptive demand, will be based on contracts between each oil producer and the association, composed of refiners and pipeline companies which buy or transport crude oil. J. R. Pemberton is named umpire.

## 10 years ago

August 3, 1950

Arabian American Oil Co.'s Abqaiq field in Saudi Arabia is proclaimed world's largest oil producer with daily output up to 450,000 bbl. It takes the place once held by East Texas field which produced up to 1,230,000 bbl. daily in its heyday.

Edwin W. Pauley, California oil operator, and Sharples Oil Corp., Denver, take on percentage-of-production contracts with Petroleos Mexicanos for long-range exploration and development programs in Mexico. Pauley to start with two rigs operating in northern Tamaulipas, across Rio Grande from McAllen, Tex. Sharples' contract involves properties in Vera Cruz.

# JOURNALLY SPEAKING

## Fun with Gasoline

WE SEE that the API has finally got squared away on a program that started out as a somewhat vague suggestion for doing something to expand the demand for petroleum products, particularly gasoline.

It's going to be called the "Travel Development Committee." This would seem to be a happy compromise.

Some of the planners, we understand, advocated a hard-hitting, direct-advertising and promotion campaign to get people to drive more. But others objected that the motoring public might not respond favorably to anything so blunt as a slogan commanding them to "Burn More Gas."

At the other extreme were some who thought the effort should be a subtle campaign to talk up the pleasures of motoring for recreation, possibly centering around some such slogan as "Driving Is Fun."

We don't know what took place in the API committee room, but we have heard other oil-company executives discuss the problem. At one such conversation one man expressed a wish that people would do more pleasure driving. At that remark another oil man—and a marketer to boot—snorted:

"Pleasure driving—haw! Last week I drove 500 miles coming back from my vacation, and every mile of it behind slow trucks on narrow, crowded highways. It was anything but pleasure. Next time I'll stay home and look at television."

"Me too," said a third. "I'm tired of fighting this city traffic twice a day and driving around block after block looking for a parking place. I'm going to ride the bus."

That ended that particular discussion of expanding gasoline demand by promoting pleasure driving. Apparently some members of the API group thought the same way, for the conclusion seems to have been that perhaps driving isn't as much fun as it used to be but something can and should be done to put fun back into driving.

So the plan is to work with motel owners, resort operators, picnic lovers, sports enthusiasts, highway planners, and everybody else interested in travel and recreation in a grand program to make it more pleasant to drive either for business or relaxation.

A part of this campaign undoubtedly will be an attempt to persuade motorists that gasoline itself is not expensive and that only the tax is high.

By a fortunate coincidence, The Oil and Gas Journal has prepared something which will help in this. You'll find it at page 138 of this issue. It's a little booklet that you can tear out easily, and it's titled "Why Is Gasoline Such a Bargain?"

You never saw anything like this in the Journal before. It's quite a departure for us because it's directed at the public whereas our readers are all oil men. Also we try not to burden our readers by telling them things they already know, and every oil man knows—or ought to know—everything in this little leaflet.

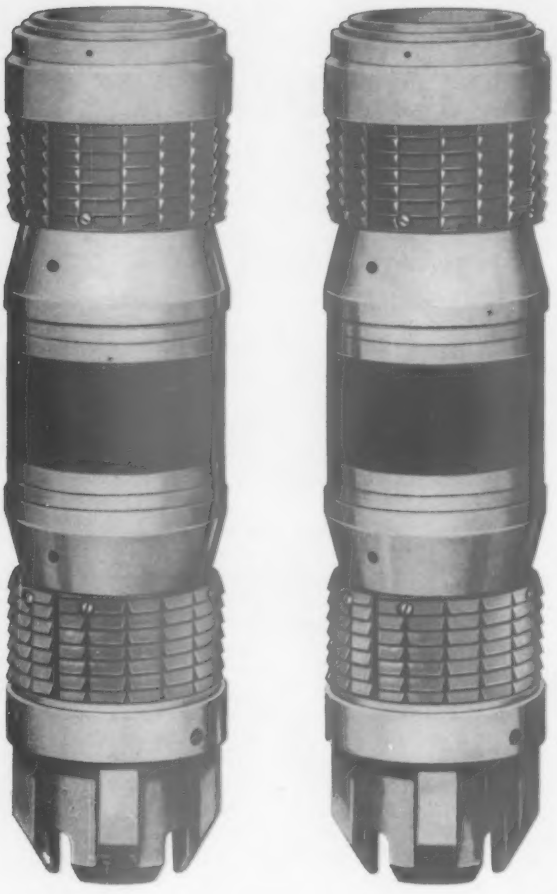
We are doing this as a service to our subscribers. You can tear it out and mail it to a friend outside the industry (notice that it will fit into even a small envelope). You can buy any number of extra copies and conduct your own educational campaign.

The booklet is written and illustrated the simplest way we know how. We deliberately stayed away from oil men's language and economists' charts. Dozens of learned professors have written long-haired treatises on prices and competition in the oil business, but we've boiled them all down to language that the guy behind the wheel can understand.

We still haven't solved the problem of making it fun to buy gasoline. But maybe this little leaflet will take some of the pain out of it by easing the motorist's mind of any suspicion that the oil industry may be gouging him.

And this may induce people to start having more fun with gasoline even though they are made to realize that Uncle Sam is hitch hiking on every trip they take.

*—Henry D. Ralph.*



LEFT: SIZE 3B
BAKER WIRE LINE
BRIDGE PLUG
PRODUCT 400-N
RIGHT: SAME

# IDENTICAL

The Baker Bridge Plug on the left was made a year ago. The one on the right is new. The two are identical —no design changes for a year. Why no changes? Is the design that good? The answer is yes.

For the first few years, changes came fairly often. Now they come few and seldom. The design is now a stable one—tested, refined, proved in thousands of wells. The weak points have been sifted out, the strong points made stronger.

The design is stable but it isn't frozen. Our engineering studies continue. We're always on the alert for any chance to make a good design better.

And consider this: the two plugs in the picture are not only alike in design, they match each other in quality. They're identical in dimensions, materials, workmanship. The men who design and build Baker plugs insist that it takes uniform quality to give you uniform dependability.

Today's Baker Bridge Plugs master any well—the average wells and the hot, high pressure wells. They are tough and reliable.

Baker plugs are short. They drill up quickly and easily. They're made in drillable, corrosion-resistant cast iron for permanent service, and in fast-drilling magnesium for temporary service.

Leading Wire Line Companies set Baker Wire Line Bridge Plugs accurately and promptly. Other models can be set on tubing or drill pipe.

## BAKER BRIDGE PLUGS

**BAKER OIL TOOLS, INC.** HOUSTON / LOS ANGELES / NEW YORK

# Come September, refiners will face some decisions

WITHIN THE NEXT couple of months the oil industry will be able to test the soundness of some of the economic theories and predictions it has discussed for many years.

The prorating states have done an effective job of holding down allowables during June, July, and August. Crude stocks are about at the bottom of the range that refiners have said is desirable, and are still falling. By Labor Day the spot crude market should be pretty tight for the first time in years.

Then we will see what will happen.

WILL REFINERS REDUCE RUNS? There has long been a theory that the only way to get refiners to keep their runs in balance with demand is to cut off their crude supply, because "giving a refiner crude is like putting candy in front of a baby."

By September the total supply of readily available crude will not be above current needs, but stocks of refined products may still be much in excess. Even so, some individual refiners may feel pinched. Will they buy or borrow crude or products from others? Or will they raise a hullabaloo with allegations of shortage?

There is a considerable body of opinion that crude prices should go down when product prices decline. The crude price was indeed shaky last spring but the current lack of oversupply puts it on much firmer ground. But continued high refinery runs and products stocks threaten to halt or reverse the recent upward movement of products prices.

If this happens, will refiners cut the price of crude in the face of a short supply? Or will they pay premiums for crude in the belief that the incremental profits from maximum throughput will bolster their net realization? Can we have simultaneously a tight, firm crude market and a loose, sloppy products market?

Crude production probably should rise some in September. But if refinery runs stay high until then will prorating states be decoyed into removing all restraint? Will the first frost bring back a crude oversupply?

IT WILL BE INTERESTING to watch what happens this fall, and who has learned what lessons from the chaotic crude and products markets and the supply-demand imbalances of the last several years.

But before anyone makes decisions he should study the figures and look at forecasts, such as that in last week's issue of the Journal.

Total demand during the last half of 1960 will average 100,000 bbl. per day less than during the first half. To end the year with stocks anywhere near desirable levels, crude production should not average more than 125,000 bbl. per day more than the first half—which is not a big jump.

And refinery runs should not average above 8,134,000 bbl. per day—which is less than the average of recent weeks.

Photo by courtesy of Sperry-Sun Well Surveying Co.

# They're getting the record fast . . . and right

**No need to pull drill pipe out** of the hole every time a magnetic survey is made. Their drill stem is equipped with a **non-magnetic drill collar.** Errors are not introduced by magnetism in the collar. This efficient tool was developed by the Sperry-Sun Well Surveying Company of Houston, Texas more than a decade ago.

What's a non-magnetic collar made of? "K" **Monel*** age-hardenable nickel-copper alloy! In addition to being **non-magnetic,** "K" Monel alloy has **high density, excellent strength** and **toughness,** and **good resistance to corrosion and fatigue.** When you get drilling equipment, make sure you're getting "K" Monel alloy collars. Then you'll get the record fast . . . and right.

*Inco trademark

**HUNTINGTON ALLOY PRODUCTS DIVISION**
**The International Nickel Company, Inc.**
**Huntington 17, West Virginia**

**"K" MONEL®**

# What Evidence Justifies Gas Prices?

● That's the question Phillips is asking FPC. Says Phillips: Either okay prices in the Transco case or tell producers what's needed to justify them.

THE Federal Power Commission now has the "best possible opportunity" to say what sort of evidence a gas producer must show in support of his initial prices when applying for a certificate to sell to an interstate pipeline.

That's the challenge put to FPC last week in a motion filed by Phillips Petroleum Co. Phillips is one of a group of producers committing a big volume of offshore Louisiana gas to the current expansion program of Transcontinental Gas Pipe Line Corp.

FPC, says Phillips, should either reaffirm its original order approving the sale and the price, or it should now tell producers exactly what information is needed to prove that the sale is in the "public convenience and necessity."

**What's involved . . .** This Transco case is the most frustrating ever presented to FPC by the Supreme Court.

Nearly 2 years ago FPC approved the sale to Transco at field prices ranging from 22.4 to 23.3 cents per M.c.f. In so doing, FPC rejected its staff's recommendation to condition the certificates to a price of 17 cents—considered to be the then prevailing level in South Louisiana (OGJ, April 7, 1958, p. 108, and Sept. 15, 1958, p. 110).

In that Transco decision FPC followed the pattern it set in the milestone CATC offshore case. In that case it tried to condition the sale at 17 cents, but the CATC producers refused to accept certificates and began dickering for intrastate sales.

Then FPC reconsidered and said that public convenience and necessity justified the additional supply at the higher price. The Transco ruling followed shortly after.

Meanwhile CATC was taken to the courts and the Supreme Court sent it back to FPC with orders to dig up some sort of evidence to support its judgment that the price it approved was in the public interest.

That left Transco out on a limb, and last December the Supreme Court sawed off the limb (OGJ, December 21, 1959, p. 47). It sent the case back to FPC with instructions to "take another look at it" in light of the CATC case.

To date FPC hasn't decided what to do about the CATC prices, though it has taken reams of evidence on the subject.

**Phillips' motion . . .** Now comes Phillips (one of the Transco suppliers) and asks: "What kind of proof do they want? What kind of evidence can producers give that would demonstrate public convenience and necessity?"

Cost evidence? If so, what kind? Phillips outlines the dilemma:

**. . . System-wide cost** determination, such as is used in a general investigation of a producer's rates has been ruled by FPC to be inappropriate for pricing an initial sale in a new area.

**. . . Individual costs** of the separate producers in the field would give a wide variance of different prices, and FPC has ruled (in the West Edmond case) that this is not in the public interest.

**. . . Local field costs** can't be ascertained in the early stages of development until more is learned about extent of reserves, development costs, liquid recovery, allocation of total company exploration and overhead costs to this field, and similar factors. FPC has rejected (in the Kerr-McGee case) prices based on costs of individual sales that don't reflect company-wide costs.

So if cost evidence is required, some other type of cost method must be devised or else it will be impossible to make any new sales into interstate commerce.

And if not cost evidence, what other kind of proof of public convenience and necessity? Producers have no way of telling how much gas the pipeline, its distributors, and the ultimate consumers need or at what price. The Supreme Court (in the CATC case) denied producers access to pipelines' records on such matters.

For years, says Phillips, distributors have been insisting that producers must bear the burden of proving that their prices are just and reasonable. But every method of proof attempted by producers has been rejected and rebuffed. And to date nobody has suggested what sort of proof would be acceptable.

It is high time, says Phillips, for FPC to answer this question. And it will never have a better opportunity than in this Transco case.

## U. S. to Swap Oil Tours With Russia

A PARTY of eight U. S. oil executives leaves this week on a month-long tour of Russian oil operations.

The trip is regarded as an official one.

The eight are:

W. W. Keeler, executive vice president of Phillips Petroleum Co., Bartlesville, Okla.

Ira H. Cram, senior vice president of Continental Oil Co., New York.

George S. Dunham, director of Socony Mobil Oil Co., New York.

Whitney M. Elias, vice president of Pan American Petroleum Corp., Tulsa.

George P. Getty, president of Tidewater Oil Co., Los Angeles.

George T. Piercy, head of the petroleum-economics department, Standard Oil Co. (N. J.), New York.

Neal J. Smith, vice president of Chevron Oil Co., Houston.

Dr. Neyes D. Smith, Jr., vice president of Shell Development Co., Houston.

The party is to be accompanied by several oil and gas specialists from the Department of the Interior who speak Russian, it was learned.

The plans are for the team to visit Russian oil refineries, as well as offshore drilling in the Caspian Sea and operations in Baku field.

The plans call for the Russians to send a reciprocal delegation to look over U. S. oil operations in September or October.

**"I believe that individual manufacturers and exporters should stop dealing with Cuba in their own self-interest."**

# Let's Not Sell to the

## Treat them as undesirable

AMERICAN BUSINESSMEN, worried about the expropriation of private property in Cuba and the disruption of trade caused by the spread of international Communism elsewhere, can fight back with a familiar device of free enterprise: Don't sell to undesirable customers.

This is the one-man crusade of William Guier, retired president of Unit Rig & Equipment Co. of Tulsa.

He is writing personal letters to scores of manufacturers and exporters throughout the United States urging them, in effect:

"Don't look to Washington to tell you what you should do. Set your own foreign policy. Decline to sell spare parts and essential equipment to Cuba so long as the Castro government remains hostile to American interests."

An unofficial embargo on sales to Cuba—particularly of key replacement parts for essential industries—would quickly bring the Cuban economy to a halt and show the Castro regime that it must operate under the rules of international

**Q. Where did you get the idea for this campaign?**

A. Partial inspiration came from the action of Standard Oil Co. (N. J.) in warning tanker owners that those who haul Russian crude oil to supply the company's refinery expropriated by Castro need expect no future business from Standard.

I also noticed that some other exporters were considering doing something of the same, while others seemed to be in doubt as to what their policy should be.

**Q. Are you concerned that some people may say that this is going over the head of our State Department and that businessmen are taking foreign policy into their own hands?**

A. No. This isn't meddling in foreign policy. The State Department moves slowly and may have good reasons of international policy for not clamping an embargo on exports to Cuba.

But individual companies and industries are not prohibited from swift and decisive action. It should be made clear that these companies are motivated by adherence to sound business practices.

The mounting international crisis needs immediate attention. Businessmen can stay in character and still cope with this situation naturally and forthrightly — on a do-it-yourself basis—proving to themselves and to the world that free enterprise is dynamic and can be formidable when needed, as well as benevolent when encouraged.

Businessmen are cognizant of the fact that they wield considerable influence, but at the same time they feel that they are tremendously handicapped in dealing with ultraliberal politicians at home and abroad. If they are ever to enjoy some semblance of world-wide order and sanity in international trade, businessmen must look within themselves for the solutions to their problems. They must use the talents and resources which they have in abundance but which they are prone to overlook or underrate.

**Q. Do you contemplate an organized boycott of Cuba?**

A. No. I don't want to see a formal organization set up, nor do I think this should be a project of any established group or association. I believe that individual manufacturers and exporters should stop dealing with Cuba in their own self-interest.

**Q. Is there any danger that this might be considered a conspiracy in restraint of trade?**

A. No. So long as exporters act individually, they have every right to decline to deal with an unsatisfactory customer such as Cuba. Moreover, they have a duty to defend American methods of doing business and to fight back against any who attempt to undermine them.

**Q. How are you conducting your campaign?**

A. I am writing individual letters to hundreds of businessmen and enclosing a brief statement of my views. I ask each one to consider the proposition carefully from the standpoint of his own interest, and to take such individual action as he sees fit.

**Q. What is your approach to these businessmen?**

A. I remind them that they are troubled by the fact that U. S. industry finds itself unable to meet problems of foreign trade relations and has been guilty in many cases of looking to our Government for help, while at the

**"Business leaders can state that they will do business only with bona fide owners . . .**

# World's "Castros"

## customers, Guier urges businessmen

**"By widespread action in cutting off supply of essential parts and services, industry can bring upstarts like Castro to their knees."**

law and accepted business customs, in Guier's opinion.

It would also, in his opinion, show other nations that capitalism is not defenseless in economic warfare and that if Communism wants to play rough, free enterprise can play rough too.

Guier is no crackpot. He is a prominent engineer and an inventor of equipment for the oil industry. He founded Unit Rig & Equipment Co. and built it up into an international supplier of drilling rigs. Since selling out his interests a few years ago, Guier has devoted much of his time to a variety of political and community causes. One of his continuing campaigns is to get businessmen to take a more active part in politics.

In view of the fact that some American companies are asking the State Department's advice on exports to Cuba, others are doing business as before, and still others are quietly cutting off sales. The Oil and Gas Journal questioned Guier about his campaign and got these answers:

same time denouncing the trend toward more Government in business.

I explain to them that swift action is needed by many different industries with far-reaching effects so that foreign governments that are tempted to yield to headless minorities or demagogic politicans can recognize the pattern and realize that irresponsible policies will bring prompt reaction.

**Q. Isn't this proposal a new attitude for American businessmen?**

A. Not at all. U. S. business people are accustomed to competition—tough, ruthless, and sometimes unethical.

**"... or those who have proof of title, thus discouraging confiscation without proper compensation."**

They know the importance of taking the initiative in dealing with a competitor. But to see their country rocked back on its heels repeatedly, kept on the defensive instead of on the offensive, is frustrating to the spirit and character as well as to the pocketbook. Patriotism as well as profit motivates them in seeking a solution to the problems of international trade.

There is a great deal that industry can do to protect itself and still stay in character, giving boost to Uncle Sam's prestige while definitely not leaning on Government. In this technological age even relatively backward nations are heavily dependent upon complex machinery and equipment, much of it of U. S. design, manufacture, and supply. All of these items require replacement and maintenance parts and service.

**Q. How effective do you think your program would be?**

A. By widespread action in cutting off the supply of essential parts and services, industry can bring upstarts like Castro to their knees, and cause them to lose support of the people who have looked to these false leaders in vain for relief. There need be no embargos or sanctions of any kind imposed by Government.

Businessmen have for some time been seeing things that bode no good throughout the world. This is a compounding problem that, if not soon faced, can end in disaster. Such action as I propose could hasten Mr. Castro's downfall, cause Mr. Khrushchev to waver, putting him for once on the defensive, and force some of our own free-wheeling liberals to pause in their venturing.

As for business leaders, they will regain confidence in themselves; and others looking to them, including conservative administration and legislative leaders, will have new hope. Perhaps not quite so obvious but just as effective can be the little breakdowns close to the people, such as appliances, cars, buses, etc.

When little things like this go wrong and upset family life and individual jobs, the people will stop looking to dictators as the providers of all the things they have promised.

**Q. Should this be a secret program?**

A. It is not essential that it be a sub rosa movement. But to be fully effective it should be carried out by individual companies as though it is the natural action in each case consistent with sound business practice. After each business leader determines how effective he can be, he should recommend the same program and exert his influence on his vendors, customers, and other business contacts at home and abroad who have any dealings with countries such as Cuba.

Furthermore, the influence of U. S. firms should be brought to bear on foreign firms to prevent their supplying substitute parts and services or serving as transshipping points.

**Q. How widespread are you at-**

**"If we must wait for government action . . . relief will be agonizingly slow."**

**tempting to make your campaign?**

A. Almost every industry should participate in this program, with the exception of those supplying goods and services of a humanitarian nature, such as medical and hospital equipment, the withholding of which would go against the spirit of the American people.

Most important would be basic equipment essential to the operation of a country's economy, such as petroleum refining, electric-power generation, transportation facilities, construction equipment, machine tools, factory equipment in general, and instruments and control devices. A second group of industries of only somewhat less importance would include consumer goods and equipment such as household appliances, passenger transportation, plumbing, elevators, radio and television, etc.

**Q. How can you justify this sort of action by American businessmen?**

A. When a businessman has a customer who is delinquent on payments, who is a poor credit risk, or whose general business practices fall short of integrity—such as being a party to patent infringements—the customer is ordinarily politely notified that there will be no further dealings until such time as his business practices meet satisfactory standards. Business leaders can further state that they will deal only with bona fide owners or those who have proof of title, thus discouraging confiscation of industries without proper compensation.

**Q. Are you centering your campaign against the Castro regime only?**

A. No. There could be other Castros. The trend must be arrested. The Cuban situation is an outstanding example of gross violation of the ethics of trade by irresponsible foreign politicians goaded by international communism to the detriment of U. S. private business and the prestige of this nation. It is obvious that more such situations will arise unless they are dealt with promptly and effectively.

If we must wait for government action with its ponderous diplomatic, legislative, and bureaucratic machinery, and its interference from pressure groups, relief will be agonizingly slow, but if free enterprise applies its own dynamic tried-and-proved methods, the current situation will be remedied and further transgressions against U. S. business effectively discouraged. This is free enterprise in action—defending itself without recourse to Government in the best American tradition.

**Q. Is your program in harmony with the official policy of the United States?**

A. President Eisenhower has said, "I do not believe that just great sums of money (appropriated by the Government) are the answer." Our part of the answer lies in refusing to service equipment and appliances of U. S. manufacture, estimated to be as much as 75% of the total—unless, of course, Castro and his followers mend their ways. It takes little imagination to see how demoralizing a shutdown can be when caused by absence of a part in a vital machine. When this happens the communist countries will find themselves on the defensive with a major setback in the cold war.

# Pauley Joins Marketing Parade

**• Pioneer California independent producer has one pilot station operating, will announce plans later this month.**

ADD Pauley Petroleum, Inc., to the growing list of companies jumping into the West Coast marketing business.

The independent producing firm announced last week it has organized Pauley Stations, Inc. Joe W. Perry, a veteran marketing man has been hired as executive vice president of the new firm. Perry was at one time marketing manager in New York for Tidewater Oil Co. and joined Pauley after serving as sales manager for Hancock Oil Co. Edwin W. Pauley is president of the new firm.

Pauley will market under the multigrade system, offering nine grades of gasoline from one pump. The company has a trial station at Morro Bay, a California coastal town north of Los Angeles in San Luis Obispo County.

An announcement is expected later this month on just how big an operation Pauley plans.

The first indication that Pauley would get into the marketing business came last year when the company purchased Newhall Refining Co., which operates a 3,000-bbl. refinery in the Los Angeles area. This was the company's first departure from production and exploration.

Much attention has been focused on the West Coast marketing business in recent months. Humble Oil & Refining Co. and Gulf Oil Corp. recently entered the picture by purchasing independent marketers. And several other majors not now marketing in the area are interested in moving into the market, which is the biggest gasoline market in the world (OGJ, June 27, p. 80).

# $CO_2$ Flood Planned for Pecos County

A PECOS County flood using the ORCO carbonated-water process was proposed last week to the Texas Railroad Commission by Helmerich & Payne, Inc., Tulsa.

The company asked permission to flood 1,200 acres of the 1,750-ft. Queen sand in White & Baker field. It estimated secondary recovery at 6,000,000 bbl. and told the commission it believed that 2,000,000 bbl. of the extra oil would be due entirely to the use of carbon dioxide in the injection water.

Helmerich & Payne said it hoped to begin injecting in October through 16 wells on a 20-acre, 5-spot pattern. Partners in the project are American Petrofina Co. of Texas and Oil Recovery Corp., which owns the ORCO process.

The project envisions flooding with carbonated water for 3 years, followed by plain water for 6 years.

Carbon dioxide would be trucked to the wells in liquid form from a liquefaction plant to be built by West Texas $CO_2$ Co., formed recently by Helmerich & Payne and Oil Recovery Corp., in Pecos County (OGJ, July 11, p. 64).

## Rising Costs Prompt Strong TGT Plea for Higher Rate of Return

TENNESSEE Gas Transmission Co. is making a strong plea to the Federal Power Commission for an increase in the rate of return to pay for heavy increases in the cost of borrowing.

Tennessee Gas has asked FPC to grant it a 7% rate of return instead of 6%—the rate in effect since 1946.

The cost of debt capital to Tennessee Gas has risen 64% in the past 14 years, and this has eaten into the earnings rate of the company, a brief filed with the FPC explained.

"A 7% return today is equivalent to a 6% return just a few years ago, with no consideration given to the factor of inflation," the brief said. "On the other hand, a 6% return for Tennessee Gas today would be equivalent to a 4.9% return in 1946."

Thus, said the brief, the company does not actually seek an increase in the rate of earnings on the company's common equity. The 7% return will provide a lower rate of earnings on common stock than the earnings rate resulting from 6%.

Tennessee Gas is suffering simply because it has expanded. Had it remained static and not raised more than $200 million in additional debt capital since 1956, it would not be seeking a higher rate of return, the brief explained.

"Whether we approve or not," it said, "the fact remains that the cost of money has increased substantially in recent years . . . If earnings on equity are not to be eroded by virtue of the increase in the cost of debt, such increase must be offset by an increase in the over-all rate of return."

## Leasing of Roads Limited

TEXAS counties have no authority to execute an oil and gas lease on a county road right-of-way.

This highly important opinion was rendered by Atty. Gen. Will Wilson in answer to a query by the Kleberg county attorney. A ruling in the opposite direction might have opened a pandora's box of troubles for operators in existing oil and gas fields.

Wilson pointed out in his opinion that several other court cases have held that roads in Texas counties, even though the counties held proper deeds, were still the property of the state. Therefore, no county, he said, has the authority to grant mineral leases in the absence of some legal authority.

## watching WASHINGTON

Clyde La Motte

### • Oil firms are facing tough decisions abroad . . .

THE CURRENT situation in Cuba points up the unhappy fact that oil companies operating abroad increasingly find themselves being put in the position of being ambassadors without portfolio.

Oil frequently becomes a key issue in world political problems, as in the case of Cuba. As a result, the action of oil company officials can have an important bearing on an international situation.

Yet the oil companies, turning to the State Department for signals, don't get any clear-cut ones. They have to proceed on their own, hoping that what they do turns out to be the best for all concerned.

Right now, for example, the State Department is encouraging oil companies to refuse shipments of oil specialties and oil equipment to Cuba—and to urge their suppliers to do likewise.

The companies say they are perfectly willing to do this but, in turn, they want the State Department to request the Department of Commerce to put these items on a restricted list.

They point out that two things would be achieved by such action: It would give the companies which have been trading with Cuba a valid reason for discontinuing doing so, and it would close the door on any less scrupulous firm that would not abide by any voluntary ban.

### • You're damned if you do, and damned if you don't . . .

Regarding the need for a valid reason, some companies point out that they have contracts to supply certain oil items to Cuba. In the absence of any U. S. government action restricting such shipments, the companies run the danger of being sued in court if they fail to fulfill their contracts.

Just a few days ago a tanker was tied up in a Gulf port awaiting loading of lubricating oil for shipment to Cuba.

Contract for the oil had been made well before Castro intervened in the operation of the Cuban oil refineries.

The supplying company delayed the shipment, quietly urging the State Department to get the lube put on a restricted list.

State hedged, fearing that if it made such a move it would stir fresh criticism in Latin America at the very time the U. S. is seeking cooperation of the other Latin American nations through the Organization of American States. So State left the decision up to the company.

Admittedly, the State Department is handling a ticklish problem. But it is a ticklish spot for a company, too. And a frustrating one.

### • How about a petroleum council for State Department?

It seems apparent that the State Department needs to upgrade its oil personnel so that it can have highly qualified people with oil knowledge in positions of authority and decision. As it is now, those who deal directly with oil problems are for the most part in the lower echelons.

Perhaps one way the State Department could improve its handling of oil problems would be to set up a petroleum advisory council.

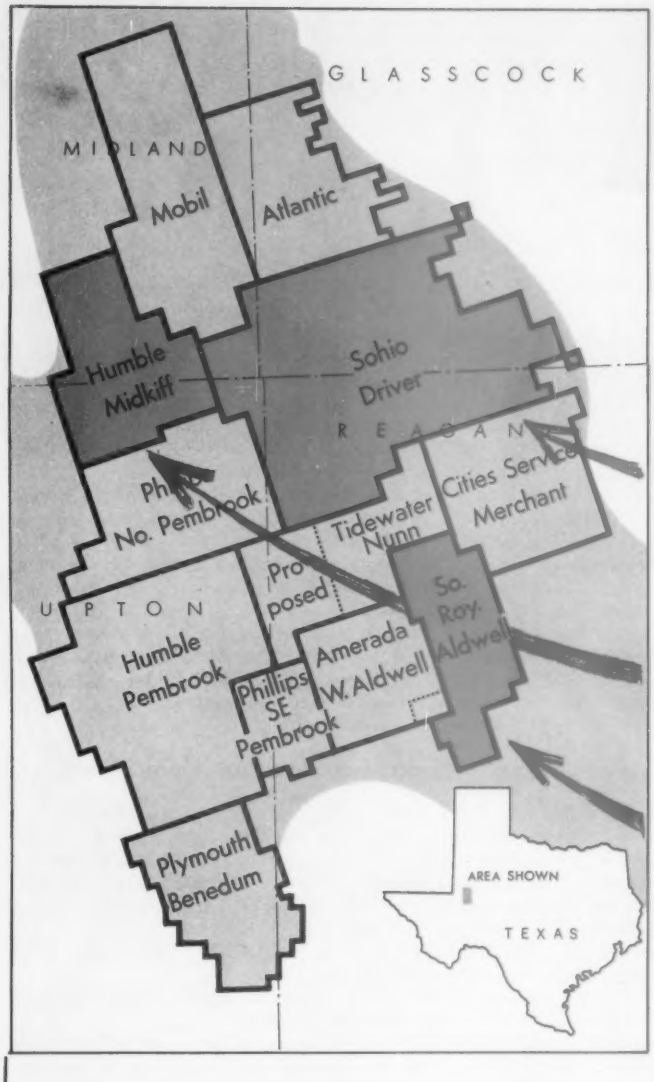
Interior Department has the National Petroleum Council to provide it with domestic facts and figures and to make necessary studies. The military, together with Interior, is setting up an industry group to help it with its oil planning. Commerce, too, has advisory groups.

It seems logical, therefore, that the State Department could profit from a similar approach.

Certainly it is clear enough that oil is going to continue to be an increasing focal point in world-wide political and economic developments. The State Department, therefore, needs all the help it can get to develop and activate decisive oil policies.

# Huge Floods

- Water injection will start this month on a program that eventually may add a billion barrels of oil to output from this enigmatic field.
- Thirteen big projects now planned, costing $85 million initially, would bring a rebirth to this once-booming area.




Sohio Driver - Awaits commission permit. Injection probable before end of year

Humble Midkiff — Approved - injection probable before end of year.

Southland Aldwell — Approved - to start injecting water this month

## Here's a quick rundown on all the planned Spraberry floods . . .

**1. Southland Royalty Aldwell unit.** 15,840 acres. Approved by commission. To start injecting water late this month. Initial cost: $2,500,000. Estimated added recovery: 19,000,000 bbl.

**2. Sohio Driver unit.** 61,440 acres. Awaiting commission permit. Injection probable before end of year. Estimated added recovery: 138,000,000 bbl.

**3. Humble Midkiff unit.** 23,568.4 acres. Approved by commission last week. Injection probable before end of year. Initial cost: $4,000,000. Estimated added recovery: 29,000,000 bbl.

**4. Phillips-North Pembrook unit.** 25,120 acres. In active stage of unit formation. But operators are hung up on participation formula. Some time yet will expire before unit is ready for commission action.

**5. Humble Pembrook unit.** About 44,480 acres. Operators actively negotiating and haggling hard over participation formula.

**6. Amerada West Aldwell.** 15,680 acres. No known negotiations between Amerada and other area operators yet. Company, however, has been working on and is expected to present finished, package proposal to others.

**7. Phillips Southeast Pembrook.** 8,000 acres. Operators have met.

**8. Tidewater-Nunn unit.** 11,520 acres. Operators have met. Also an additional 8,320 acres in proposed Tidewater-Nunn unit to the west.

**9. Cities Service-Merchant unit.** 22,720 acres. Operators have met.

**10. Mobil unit.** Expected to take in about 33,280 acres in the Tex Harvey, Midkiff and Driver areas. First operators meeting held in mid-July. Early results from the small cooperative flood with independents to the north of projected unit in Tex-Harvey area reported very encouraging—sufficiently so to influence some adjoining acreage holders to reenter and clean out nearby wells.

**11. Plymouth - Benedum unit.** Plymouth Oil planning unit of about 20,000 acres in far southern Spraberry in old Benedum area.

# in Spraberry to Make Area Boom Again

**Robert J. Enright**
District Editor

THE BIGGEST oil pool in the United States is a good bet to be completely under flood within the next 3 years.

And prospects are likewise excellent that a quite respectable amount of "the world's largest unrecoverable oil reserve" will, after all, be recovered.

The field in question, of course, is the fabulous, much-maligned Spraberry Trend Area pool in Midland, Glasscock, Upton, and Reagan counties in West Texas.

The speed with which hustling Spraberry operators are moving toward full-scale flooding is little short of phenomenal.

With the exception of a couple of past guinea-pig pilots and one existing small flood in the Tex-Harvey area, no water is yet going into the big field's tight, heavily-fractured Spraberry pay.

Sometime late this month, however, Southland Royalty Co. will spin open valves to start water coursing into the lower Spraberry zone to launch the huge field's first big unitized project.

This flood will cost $2,500,000 and take in 15,840 acres in the Aldwell area in the southeastern portion of the field.

Right on Southland's heels with even bigger projects are Sohio Petroleum Co. in the Driver area and Humble Oil & Refining Co. in the Midkiff region. Both of these units, which together take in a staggering 85,000 acres, probably will be injecting before the end of the year.

The Humble unit was given the green light by the Texas Railroad Commission early last week. Sohio is expecting its permit momentarily.

Strung out behind in various stages of preparation are at least seven other proposed big units. Some of these are being delayed by bickering over participation formulas. And others are marking time to see how the first floods fare before getting down to work in earnest.

Should the Southland, Humble, and Sohio floods live up to expectations, however, the other planned units will waste no time building up a full head of steam.

**Huge recovery promised . . .** Best estimates now are that Spraberry floods, if extended over the sprawling field's entire 500,000 acres, may harvest an oil bonanza in the neighborhood of a billion barrels.

This estimate is based on flood-recovery figures expected by Humble and Sohio. And it is conditioned by the presumption that these figures would be representative for the field as a whole. The latter is thought probable.

Humble estimates the flood take from its operation at 1,260 bbl. per acre from the upper Spraberry alone. If applied to the entire field, this would mean a total take from the upper zone of some 630,000,000 bbl.

The Sohio unit estimates its total flood haul from both upper and lower Spraberry at 2,250 bbl. per acre. This, if applied to the whole field, would appear to far exceed a total 1,000,000,000 bbl. The lower Spraberry, however, is not as extensive as the upper zone and doesn't produce in some areas of the field.

In contrast, most operators believe total primary take will not exceed 400 to 500 bbl. per acre from the upper Spraberry—or about 700-750 bbl. per acre from both zones. If applied field-wide, this would mean a total pool take from primary of only about 250,000,000 bbl. of upper Spraberry oil, and a grand figure of perhaps as much as 375,000,000 bbl. from both zones.

**World's biggest unit . . .** The huge Sohio-operated unit now awaiting the green light from the commission will easily be the world's largest.

It will take in 96 sections, or 61,440 acres, and lap over into all four Spraberry Trend counties.

Thus it will overshadow even the huge SACROC unit in Scurry County—the largest known unit now with roughly 50,000 acres in Kelly-Snyder field.

Operators meetings held but no recent activity.

**12. Shell-Republic Natural Benedum unit.** Possible. Operators may form own small unit in Benedum area using acreage in Plymouth-sponsored project. If they split off, it will be due to an impasse over method of adjusting for 40-acre development in their area. Unit would take in only about 2,500 acres.

**13. Atlantic Driver unit.** About 20,000 acres. No operators meeting held yet. Company had hoped to join other units, but operators of adjoining planned units frown on taking in the big additional acreage. Atlantic believes it probably will have to form its own unit and has sketched a tentative boundary.

**RIGS RETURN** to Spraberry after a long absence. There's been little drilling since the boom fizzled in the early 1950's. Now they're back to drill inputs, water wells, and infill producers.

The Sohio unit area is very near exhaustion of primary oil. It has produced just under 35,000,000 bbl. to date. And Sohio estimates no more than 5,000,000 bbl. still recoverable by primary means.

The area reached its peak production in October 1952 at 25,300 bbl. per day. It was down to only 3,300 bbl. per day last spring even though 196 added wells had been drilled since October 1952 and despite added fracture treatments.

All told, Sohio and other operators have drilled 574 wells in the unit area from the beginning. Of these, 5 have been plugged and abandoned, another 99 completed in the Spraberry and plugged back to shallower pays, and 103 are off production.

This leaves only 367 producing from the 6,800-ft. Spraberry. And of these, 196 are making less than 5 bbl. of oil a day each.

**Oil added: 138,000,000 bbl. . . .** Sohio estimates original oil in place in the unit area at about 500,000,000 to 750,000,000 bbl.

It figures the unitized flood will grab off another 138,000,000 bbl. of added oil and cut residual oil saturation at abandonment down to about 48% of pore space.

The unit plans to inject salt water from the San Andres formation through a closed system on a rough 320-acre, five-spot pattern. Injection will be by gravity and at a rate of about 1,500 bbl. per well a day. Inputs will be converted producers.

**The Southland flood . . .** The big Southland unit flood, as the first to be kicked off in the Spraberry, will be watched intently by Spraberry operators and the industry generally.

Latest plan of operation calls for initial injection through three wells down the middle of the north-south elongated unit. Response to injection will be carefully checked. If and when offset producing wells react favorably, five-spot patterns will be built around the first three inputs and other areas also brought under injection.

This flood is expected to cost about $2,500,000 and add about 19,000,000 bbl. of extra oil (OGJ, Feb. 1, p. 68).

Both of these figures will migrate upward, however, if the unit pursues a proposed plan to bring in another 2,500 acres of leases to the west of the present western boundary. The acreage addition would take place around the first of next year.

**The Humble project . . .** Humble's crash program to bring a unit to fruition and start flooding in the Midkiff region was capped with success with the granting of a commission permit last week.

Humble expects to begin injection within the next few months.

The 23,568-acre Midkiff unit will plunk down an initial investment of about $4,000,000 for its flood program. It expects to reap from it about 29,000,000 extra barrels of stock-tank oil.

Operators in the unit area had produced a total of about 10,500,000 bbl. as of the first of April. And, like nearly all Spraberry areas, the unit is in an advanced stage of depletion.

Currently, there are 219 completions in the unit area. Only 141 of them are producing. Their average daily rate is roughly 17 bbl. each.

The unit will use salt water from the San Andres and Santa Rosa formations. Like the Sohio project, it will inject via gravity on nominal 320-acre, five-spot patterns. Per-well input rate will average about 1,000 bbl. daily.

Humble, as operator, will convert 60 oil wells to input service and 16 more to water-supply wells. It will drill 10 added injection wells and 12 more producers.

**Boon to the industry . . .** The waterflood rebirth of Spraberry is certain to act as a great stimulant to the oil industry generally and to equipment and service firms especially.

Many millions of dollars will pour into Spraberry floods in a steady stream over a period of several years. Tremendous sums will be spent for drilling new producers, water supply wells, and inputs. More will go for revamping and converting existing wells for different jobs.

A large number of treating plants will be built to handle the brackish water from the San Andres and Santa Rosa formations. Operators will use thousands of miles of pipe for water.

They'll use mountains of meters, filters, valves, cement, well heads, and other equipment and supply items.

Logging, fracturing, and other service firms likewise will experience a sharp lift.

Here is a rough but probably pretty valid estimate of what is meant in dollars to flood a 500,000-acre field:

Humble estimates the initial cost only of the 23,500-acre Midkiff project at $4,000,000. This figures out to about $170 per acre.

The per-acre cost is certain to fluctuate up and down in various other parts of the field. Assuming it to be a reasonably accurate average, however, the initial cost only of flooding the entire Spraberry will approach an astronomical $85,000,000.

## Refinery Moving

### ...from Aurora's Michigan location to Genoa, Italy.

ENGINEERS and workmen are dismantling the 10,000-bbl. refinery of Aurora Gasoline Co. at Elsie, Mich., for shipment to Genoa, Italy, later this month.

New owner of the plant will be the Sanquirico Refinery Co. headed by Angelo Volgato and Clemente Vigna. It was sold by W. C. Berry, independent Tulsa broker, who bought the shut-down plant from Aurora.

Berry described the plant as one of the most modern small refineries in the country, having been on stream only a few years. It has a 1,500-bbl. UOP Platformer. The plant became surplus when Ohio Oil Co. acquired Aurora.

Crews of Universal Engineering Co., Tulsa, are taking the refinery down, part by part, marking the parts and packing them for shipment. Berry has chartered a freighter scheduled to be at the Detroit docks August 27 to load.

When the dismantled refinery reaches Genoa, Universal crews then will put the plant back together and make a few processing changes. It is scheduled to be on stream within 4 months after reconstruction starts.

The Genoa plant is the second Berry has sold to Italian investors. His first was a 10,000-bbl. plant bought by Raffinerie Siciliane Olii Minerali at Augusta, Italy.

## PIPELINE

**Construction** of two Iowa gas lines for Natural Gas Pipeline Co. of America has been started by River Construction Corp. The 95 miles of 36 in. will run from Haskins to Rose Hill and from Stennett to Pacific Jct. Completion is expected in November.

**A $1,750,000 compressor** station is planned at Rawlins, Wyo., by Colorado Interstate Gas Co. The station on the Green River-Denver transmission line is one of 10 planned under a $91 million expansion program. The Rawlins station, now waiting for FPC approval, is scheduled for completion by December 15. Contractor is Stearns-Roger Manufacturing Co., Denver.

**An 8-in. line** to connect Southern Union Gas Co.'s Artesia Junction, N. M., compressor station with Pan American's Empire Abo gasoline plant

# Mobil Gets Gas in Rank Test

MOBIL Oil Co. has extended petroleum production to the westernmost tip of the vast Delaware basin in Texas with completion of a wildcat as a good gasser.

The well is 1 State-Barrett in Section 18, Block 63, T-2, T&P Survey, 12 miles east of Pine Springs in central Culberson County in far West Texas.

The 1 State-Barrett was completed for a calculated absolute open-flow potential of 13,500 M.c.f. daily with tubing pressure of 2,050 psi. Producing zone is the Strawn Pennsylvanian at 5,814-29 and 5,842-57 ft. Nearest production is about 30 miles eastward at Rustler Hills, an old shallow producing area. The nearest production of any consequence is about 36 miles east at Geraldine field while the nearest Pennsylvanian production is 50 miles northeast in James Ranch field of Eddy County, N. M.

Mobil holds 60,000 acres in the area of its discovery and plans a second test.

**Strike in channel . . .** An important Ellenburger gas-condensate discovery in the Sheffield Channel area was made later in the week by Shell Oil Co. and Humble Oil & Refining Co.

Their joint wildcat, the 1 Blackstone-Slaughter, flowed 546 bbl. of condensate through 18/64-in. choke during the last 72 hours of testing. Perforations were in Ellenburger at 10,050-60 and 10,082-92 ft. Gas flow was 600 M.c.f. daily.

Location of the wildcat is in eastern Pecos County 5 miles southwest of Sheffield and 11 miles southeast of Ellenburger production at Sheffield field.

This is the third deep Ellenburger Cambro-Ordovician producing area in the region between the Delaware and Val Verde basins.

Puckett field to the west has 15,000-ft.-plus production in the Ellenburger. Sheffield field to the northwest has 9,800-ft. Ellenburger pay, while big Brown-Bassett multipay field to the southeast has Ellenburger pay at 11,294 ft.

Nearby shallow production to the north and northeast is from Permian formations for the most part.

## BP, Sinclair Enter Alaska

COLORADO Oil & Gas Corp. has taken in two more partners—British Petroleum Exploration Co. and Sinclair Oil & Gas Co.—in a program to continue exploring a million acres of land in the Yakutat area along the southeastern Alaskan coast.

Under the agreement, British Petroleum and Sinclair each can earn 12½% interest by assuming drilling and certain other costs.

# BRIEFS . . .

is now under construction. The line is 6½ miles.

**Contract to lay** a 72-mile 8-in. products line in Alabama for Plantation Pipe Line Co. has been awarded to Latex Construction Co. of Georgia. The project, from Helena to Montgomery, will be completed by October 1.

**A 43-mile 24-in. gas line** from Jenks to Oologah, Okla., to be built by Transok Pipe Line Co., Tulsa, has been contracted to Williams Brothers Co. Construction will start the first week of August.

**Subcontract for 231 miles** of 4, 6, and 8-in. LPG pipeline from Artesia, N. M., to Midkiff, Tex., has been awarded by Williams Brothers Co. to McVean & Barlow, Odessa, Tex. Williams Brothers is turnkey contractor for Mid-America Pipeline Co.

**Shell Pipe Line Corp.** will erect a technical-development laboratory and a service building on an 18-acre tract in southwest suburban Houston. The laboratory, 176 by 66 ft., will contain four general-purpose laboratories, a heavy-equipment lab, 12 offices, and a conference room, shop, library, lunchroom, and darkroom. The service building, to be occupied by the Texas-Gulf division of the company, will be 144 by 42 ft. and will consist of office and storage space. The buildings will be completed in 1961.

**Bids are** to be asked soon on the first 50 miles of Great Northern Railway's projected 110-mile crude line in North Dakota. Construction on the 50-mile segment between Newburg and Minot is to begin late this month. It will serve Newburg, Wiley, and Glenburn fields. A 10-in. line will be laid from Wiley to Minot and 6-in. from Newburg to Wiley.

## Also for Pipeliners . . .

**IN THE NEWS:** Phillips in the Transco case is asking FPC to tell the producers what evidence is needed to justify gas prices (p. 79) . . . Rising cost of capital borrowing prompts TGT to ask FPC for higher rate of return (p. 83) . . . Transwestern system is ready to move gas into California but is balked until FPC settles a price dispute (p. 88) . . . Arkla sews up big gas supply with contract to take Gulf's production in Arkansas Valley fields (p. 91) . . . Spending of gas industry is setting new records (p. 98) . . . Oasis seeking permission to build crude line from Dahra area to northern coast of Libya (p. 103).

**DESERT CROSSING** of Transwestern's line required a special Bitumastic coating to combat 125° pipeline temperatures.

# California Has New Source of Gas—Almost

- Transwestern's system is ready for service, but the company can't move gas until FPC resolves a dispute with Pacific Lighting over the price.

A $191-MILLION pipeline system is ready to move its first gas into California, but the flow is being blocked by a dispute over the delivery price of the gas.

Transwestern Pipeline Co. wants 43 cents an M.c.f. for the gas at the California-Arizona border. Its California customer, Pacific Lighting Gas Supply Co., wants to pay only 42¼ cents a thousand. The dispute is before the Federal Power Commission, but no decision has been made.

FPC action is expected any day, but until it comes Transwestern's long fight to move into the California natural-gas market will be stymied.

When Transwestern does start moving gas, it will mark the end of El Paso Natural Gas Co.'s 12-year reign as the sole out-of-state source of natural gas for Southern California. El Paso Natural moves 1.042 billion cubic feet of gas into southern California daily.

Transwestern has contracted to sell 300 million cubic feet of gas daily to Pacific Lighting, and the California company has first call on additional volumes up to a total of 640 million cubic feet.

**Why the delay . . .** Transwestern has overcome a series of regulatory difficulties since proposing its 1,807-mile system from North and West Texas.

FPC conditions imposed to solve one of the problems facing Transwestern several months ago are causing the eleventh-hour delay now facing the pipeline.

In the initial agreement between Transwestern and Pacific Lighting, the two companies agreed on a maximum delivery price of 45 cents an M.c.f.

However, the FPC later conditioned producer prices, trimming them an average of 2¾ cents an M.c.f., according to Pacific Lighting.

Pacific Lighting maintains that since FPC conditioned the field prices of gas, the delivery price should reflect the lower field prices. They arrived at their price of 42¼ cents an M.c.f. by subtracting the 2¾ cents average cut in field prices from the 45-cent initial maximum price.

However, Transwestern says it is entitled to a 6½% rate of return, which would place the delivery price of the gas at 43 cents an M.c.f.

A spokesman for Pacific Lighting said the company is not arguing from the rate-of-return angle, but is basing its contentions on the initial agreement reached by the companies when the project was first proposed.

Should the FPC approve the 43-cent rate proposed by Transwestern, Pacific Lighting would petition the California Public Utility Commission for an "offset rate" which would cover the higher price of the gas. The California company would make no more money under an "offset rate," but would receive a higher rate to offset the increased cost of the gas.

Even after the price schedule question is resolved by the FPC, Transwestern faces additional dealings with the FPC. However, these involve producer prices and would not delay delivery of gas. Some of the producers want the FPC to rescind the conditions attached to field prices.

**Construction . . .** More than 2,000 miles of pipe has been laid in the drive to move Transwestern gas into California.

The Transwestern system includes 1,807 miles of pipe ranging in diameter from 4 to 30 in. and two Pacific Lighting affiliates, Southern Counties Gas Co. and Southern California Gas Co., have laid 231 miles of line in California to receive the gas.

The new line meets Pacific Lighting's line just north of Needles, Calif. Transwestern's main line runs from Needles to near Roswell, N. M., where one leg runs northeast into the Texas Panhandle and another southeast to the Pecos County area of southwestern Texas (OGJ, Aug. 17, 1959, p. 94).

The main line of the Transwestern system was completed last May but some gathering lines are still being laid.

Transwestern's compressors have been installed and tested at five stations. There are four compressors on the 30-in. line between Roswell and Needles. The fifth station is on a 24-in. lateral from Perryton, Tex., to Roswell.

This bubble-tight seal

# can't cause contamination... costs nothing to maintain!

## Stockham's NON-LUBRICATED Wedgeplug*'O-SEAL' Valve

Meet the valve that gives you permanent, absolute shut-off without sealing compounds or lubricants. The valve that eliminates the danger of contamination resulting from excess lubricant being forced into the product stream. Eliminates the danger of product mixing in manifolds.

The valve is Stockham's NON-LUBRICATED Wedgeplug "O-Seal" — now widely used in general purpose services. Two Teflon† "O" rings in the plug provide the pressure-seal—provide permanent "bubble-tight" shut-off in all cases.

The "O-Seal" is guaranteed not to stick . . . provides double-block and bleed in most services . . . has flawlessly machined metal seats to provide shut-off in case of fire.

*Patented — †Teflon, Dupont Trademark

Call your Stockham Distributor or Sales Representative now, or write Stockham for complete details about the "O-Seal."

Complete ranges of sizes and types available.

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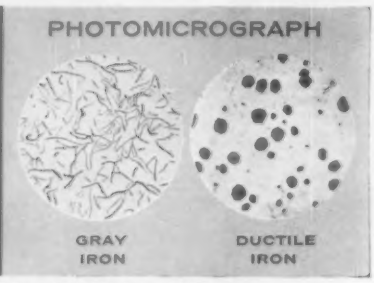
# PUMPAGE

**Goulds news about pumps for process industries**




## Lubricate with oil or grease?

If all you're thinking about is lubrication *per se*—oil is better than grease. It's easy to cool, stable, easily replaced. But . . . there are problems. Oil, contaminated by even tiny amounts of moisture, fumes, dust, shortens bearing life. Keeping oil level right for both small and large bearings is difficult. Grease lubrication almost completely solves these problems. It forms a barrier that keeps contaminants from reaching the bearing. It doesn't churn through the bearing, bringing contaminants with it. It *ends* the problem of lubricant level. We feel that grease is a good universal lubricant for pumps and a majority of our new units are available with *either* oil or grease lubrication . . . you have your choice of lubricant to meet the needs of any application.

## Centrifugals for cooling towers

You can pump up to 40,000 gpm from your cooling towers with the mammoth Model 3420 centrifugal pump you see here. Or, if you want the same capacity but more flexibility, try a pair of Model 3405's. In either case, you get a pump that's a cinch to work with should you ever want to go inside it. Horizontally split casing comes apart easily when you remove a few bolts. You don't disturb piping, pump, or driver alignment. You look inside, adjust, maintain in a matter of minutes. Both the Model 3405 and the big job (Model 3420) have proved themselves under the severest services. For construction details, ratings and specifications write us for Bulletins 721.6 and 721.8.

## The ductile iron difference

To make ductile iron, magnesium is added to molten cast iron, changing the sharp, thin graphite flakes to spheroids. The spheroids have large areas of iron matrix between them, and since they have no sharp edges, the ductile iron has far greater strength than the original cast iron.

Ductile iron is so tough it can be used in many applications previously requiring cast steel.

It might pay you to look into this. Write us for information on ductile iron pumps or parts.

## Intermediate range design... new way to handle hot pumpage

You know how it *used* to be—you bought a light duty pump for temperatures up to 200° and a real heavy duty pump to go from 200° to 800°. Consequently, when you were operating in the intermediate range—that area of temperature between 200° and 650°F—you usually had more pump than you needed. Well, that's changed. Here's a process pump that fits into the intermediate range like a glove. It handles all light duty applications and the growing number of intermediate applications as well. Yet it costs very little more than a light duty pump with built-in temperature limitations. For complete application data, drop us a line asking for our bulletin on the Model 3775.

## Points on a close-coupled process pump

Here's a brief bulletin—but one loaded with facts—on the Model 3675 close-coupled process pump. It gives you complete specifications on this compact, economical pump which we built expressly for the petroleum industry. It contains full construction details, dimensions, and a handy pressure-temperature chart. For your free copy, just drop us a line. Goulds Pumps, Inc., Dept. OGJ-80, Seneca Falls, N. Y.

**GOULDS PUMPS**

# Big Spending May Not Be Forced on Refiners

REFINERS in Los Angeles have received a break in their fight against smog.

The county's Air Pollution Control District has recommended a 6-month extension of a study being made to determine whether gasoline composition causes eye-irritating auto exhaust.

The study involves Rule 63, which makes it mandatory for all gasoline sold in the county to have a bromine number below 30. This is equal to an olefin content of 18%.

Rule 63 went into effect July 1, but the hooker is that in 18 months the bromine-number limit of the rule will drop to 20, or an olefinic content of 12%. Los Angeles refiners had little trouble meeting the 30-number requirement. But it has been estimated they would have to spend $40 million for downstream processing to bring the olefin content down to 12%. Operating costs would increase a cent a gallon to meet this requirement.

Extending the study 6 months doesn't mean refiners won't eventually have to spend this amount. But it is a straw in the wind that possibly the study will turn up information which may modify Rule 63. It definitely moves back the 20-bromine-number deadline 6 months.

The study is a joint effort involving APCD, Western Oil & Gas Association, the Bureau of Mines, and the Public Health Association. APCD claims there is a direct relation between the amount of olefin in gasoline and the olefins in auto exhaust.

However, the industry argues that eliminating olefins in gasoline will not eliminate olefins in auto exhaust. The study primarily involves tests of gasolines of varying olefinic content to determine which argument is correct. APCD letter recommending the extension of the bromine-20 deadline will be received by the county's five-man board of supervisors this week end.

# Arkla Sews Up Big Gas Supply

IN an unusual deal, Arkansas Louisiana Gas Co. has contracted to buy all the natural-gas production of Gulf Oil Corp. in the Arkansas Valley fields in western Arkansas.

The 20-year contract calls for the gas to be used only within the State of Arkansas, thus escaping any price regulations imposed by the Federal Power Commission.

Details on price and volume of gas involved were not revealed, but President W. R. Stephens of Arkansas Louisiana Gas announced that the contract price was profitable enough for Gulf to undertake immediate extensive drilling and development of its acreage in Arkansas Valley.

The contract covers the presently developed gas reserves in Knoxville field of Johnson and Pope counties, Spadra and Paris fields in Logan County, Washburn field of Sebastian County, and a portion of Kibler field in Crawford County.

Gulf holds leases on more than 300,000 acres of developed or undeveloped acreage in 12 counties, all of which is covered under the contract. This makes the contract one of the few in the industry to dedicate the production of a region to one buyer.

Arkansas Louisiana Gas has expanded its system to handle the Arkansas Valley gas production. The company last September completed and put into operation a 95-mile, 16-in. line from Aetna field to its main junction at Perla in Central Arkansas. The cost was $6 million.

The company has had a 10-in. line into the region since 1928. It originates in Cecil field and connects to the gas company's system near Little Rock. Stephens estimated the combined transmission system of Arkansas Louisiana Gas has a potential capacity of 240 million cubic feet daily.

# *PROCESSING BRIEFS . . .*

**Licensing agreements** have been completed allowing Sid Richardson Carbon Co. of Fort Worth to use processes of United Carbon Co., Houston, for manufacturing oil furnace carbon blacks. The processes will be used in a 50,000,000-lb. per year carbon-black plant which Richardson will build at Big Spring, Tex., adjacent to the Cosden Petroleum Corp., refinery. Richardson has been a major manufacturer of channel blacks, and the new plant will mark the firm's entry into the furnace black field.

**Shell Chemical** is expanding capacity of its styrene plant at Torrance, Calif., to 210 million pounds annually. Shell acquired the plant in 1955 when it purchased a synthetic-rubber plant from the Government. The present expansion will jump capacity almost 70% from the original 125-million-pound capacity. The expansion is scheduled for completion early in 1961. Benzene and propane feedstocks for the plant are produced by Shell and other California refiners.

**Ortho-xylene capacity** at Humble's Baytown, Tex., plant will be expanded from 44 to 72 million pounds per year. The project will be completed by the end of the year. A shortage of naphthalene, ordinarily used in the production of phthalic anhydride, has increased the demand for otho-xylene which can be substituted for naphthalene.

**Contract for** engineering and construction of Sun Oil Co.'s big naphthalene plant at its Toledo, Ohio, refinery has been awarded to M. W. Kellogg Co. Scheduled for completion late next year, the $8,000,000 plant will have an annual capacity of 100,000,000 lb.

## *Also for Refiners . . .*

**IN THE NEWS:** Pauley Petroleum is planning to enter marketing on the West Coast (p. 82) . . . Los Angeles refiners may be spared heavy spending to change composition of gasoline (p. 91) . . . Oklahoma producers are fighting trend toward making them pay cost of gathering and marketing their crude (p. 97) . . . India puts squeeze on both products and crude prices (p. 99).

**PLUS THESE TECHNICAL REPORTS:** Four problems guide modern cooling-tower design (p. 122) . . . Gas-processing plant features unusual flow scheme (p. 131) . . . Union Carbide finds that good design and layout can tame a hazardous area (p. 134).

# FOUR WAYS TO HELP STOP LOST CIRCULATION

**When the returns stop, trouble for the drilling contractor or well owner begins. Here's how Halliburton has helped operators all over the world regain circulation in drilling and casing cementing operations:**

1. **BLOCKING** channels causing circulation loss with flaky, fibrous, granular or gelling additives to mud or cement.

2. **LIGHTENING** the slurry column to decrease the pressure which forces it into a weak formation. This technique is often combined with bulk blocking materials.

3. **BLOCKING** with special slurries which thicken by pumping the waterless slurry to the loss zone, then allowing the slurry to hydrate.

4. **PLUGGING** with quick-setting cements and resins which set up while flowing into and through channels.

275 SERVICE CENTERS . .

# START WITH THESE HALLIBURTON PRODUCTS

**FLOCELE** . . . a cellulose film flake to help prevent or lessen circulation loss. Additive sizes are available for cement or drilling fluid.

**PALCO SEAL** . . . an economical redwood bark fiber proven very effective in control of lost circulation of drilling fluids.

**TUF-PLUG** . . . a special blend of graded, ground walnut shells providing high supporting strength and excellent bridging characteristics for wide fractures.

**GILSONITE** . . . a naturally occurring solid hydrocarbon with excellent bridging ability reduces cement slurry weight to as little as 10 pounds per gallon.

**EXPANDED PERLITES** . . . a lightweight mineral which acts both to block the loss zone as well as lighten the fluid column during cementing.

**HOWCOGEL** . . . a high yield bentonite which combines with water to form a high strength gel. Can be used with mud or cement.

**BDO (Bentonite-Diesel Oil)** . . . commonly referred to as "gunk squeeze", acts to stop drilling mud lost circulation by forming a stiff gel. BDO is pumped down drill pipe and stiffens when contacted by drilling fluid which is pumped simultaneously down the annulus.

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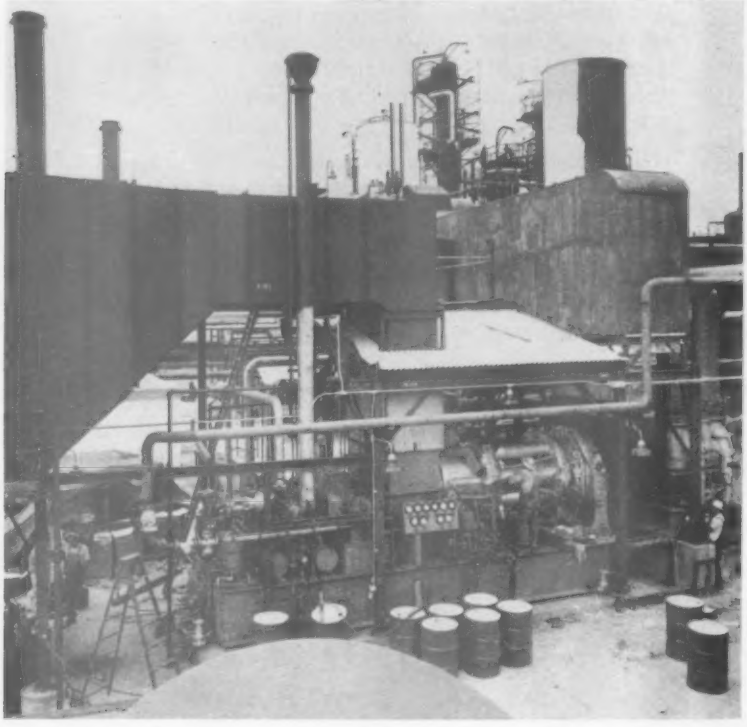
PHOTOS IN THE **NEWS**

## Storage Giant

WHEN IT GOES into operation this fall, this Pacific Gas & Electric Co. plant will supply up to 75 million cubic feet of gas daily to meet peak demand. The plant sits over the depleted McDonald Island gas field which, with a storage capacity of 178.5 billion cubic feet, is the nation's largest storage reservoir. Site is 10 miles northwest of Stockton, Calif., in the San Joaquin River delta. When the storage project is fully developed in 1961, it will have a withdrawal capacity of 400 million cubic feet daily. PG&E figures a cushion of 54 billion feet will ultimately be required, leaving 94.5 billion feet for working storage. There were 11 wells in the field when production ended in 1955. PG&E plans to drill 21 more in the 1,600-acre field. The plant under construction is elevated 17 ft. as a precaution against flooding on the river.

## Refinery Turbine

THIS 7,500-hp. gas turbine is being installed in DX Sunray's Tulsa refinery. The unit will drive two compressors on a common shaft, one a refrigeration compressor and the other a vacuum compressor. Installation is in conjunction with a solvent dewaxing plant now under construction. A filter at left removes solid particles from air charged to the turbine, which has a system for recovering heat from exhaust gases and generating 25,000 lb. of steam per hour for refinery use.



## Valves at Attention

THESE big valves, standing in precise rows like soldiers at inspection, will soon be regulating the flow of sour natural gas through British-American's big processing plant under construction near Rimbey, Alta.

The plant, a joint venture of 25 companies with B-A as operator, will take gas from Homeglen-Rimbey and Dick Lake fields. It will extract about 14,000 bbl. of liquid daily from 326,000,000 cu. ft. of natural gas. Residue gas will be delivered to Alberta Gas Trunk Line Co., Ltd., for further delivery to Trans-Canada Pipe Line and Alberta & Southern.

The big, new plant will go into operation this fall.

## Inland Butane Storage

SURFACE FACILITIES of Anchor Petroleum's Bath, N. Y., underground storage plant are checked as the first pipeline shipment of butane is received. The 8-in. line, in the foreground right, delivered the product from Atlantic's Philadelphia refinery. The brine pit for the storage plant was surfaced with layers of blown asphalt and paper. Anchor decided against a polyethylene-lined basin because it feared deer in the area might leap a protective fence and puncture the lining with their sharp hooves.

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# Oklahoma Crude Buying Stirs a Ruckus

• Small producers, stuck with pipeline charges, want something done. But, say the buyers, somebody has to foot the cost of moving crude by pipeline.

**Henry D. Ralph**
Chief Editorial Writer

SMALL producers in Oklahoma are up in arms over what appears to be a trend toward making them pay the cost of gathering and marketing their crude oil.

The Oklahoma Independent Petroleum Association is preparing a petition asking the Oklahoma Legislature or the Oklahoma Corporation Commission, or both, to make a broad study of the state's crude markets and marketing methods.

It may also ask the OCC to regulate gathering charges by truckers and intrastate pipelines. If the state's common-carrier laws do not permit this, new legislation may be sought.

"We used to sell our oil to guys who used it," said one producer. "Now we have to sell to brokers who peddle it."

"There's a definite trend on the part of the big crude users to sell or abandon their gathering systems. This puts the burden on the producer to find a refiner who will use his crude and to find ways of getting it to him."

Several crude buyers, truckers, and pipeline gatherers are engaging in the criticized practices, but fire is being concentrated on Kerr-McGee Oil Industries, Inc.

**What's happening . . .** By acquiring the gathering systems of several major oil companies during the past few years, Kerr-McGee has become one of the largest crude purchasers in Oklahoma.

About a year ago Kerr-McGee imposed a gathering charge of 10 cents per barrel, paid by producers, in one stripper-well area. It has been extending this charge to other stripper areas and apparently intends to impose the charge in still other areas in the near future.

Producers complain that this is the equivalent of a cut in the posted price of crude but they must pay the Oklahoma gross production tax on the full posted price. They also say it is discriminatory in that neighboring producers connected to other gathering systems receive the full posted price.

Like several other intrastate gathering systems, Kerr-McGee's lines are classified as plant facilities. Kermac publishes no tariffs and its rates are not regulated by the Corporation Commission. The company, itself, takes title to the oil at the lease tank.

Interstate crude pipelines gathering in Oklahoma publish tariffs. Purchasers using them pay the wellhead price ($3.05 for top gravity), plus a stated gathering charge (ranging from 5 to 10 cents), plus the trunk-line charge (25 cents if to the Chicago area). All these costs are billed to the refiner getting the crude.

When Kerr-McGee (and others similarly situated) sells crude—surplus to its own refining needs—to another buyer it delivers it into an interstate trunk line at posted price plus a 10-cent "handling charge." Thus the price to a third party is the same even though there is no published gathering tariff. Now Kerr-McGee is charging producers in some areas a dime a barrel to pick up their oil.

**Other devices . . .** Recently Kerr-McGee has introduced another sales gimmick which doesn't directly affect the producer but does help increase his market.

Most pipelines deduct 1% of the volume as "pipeline allowance" to cover shrinkage and loss in transit. This amounts to about 3 cents per barrel. Kerr-McGee now has waived this, thus giving buyers a slight advantage. Interstate pipelines cannot waive this allowance since it is a part of their published tariffs.

Other Oklahoma crude gatherers are using different devices. At least one gathering pipeline has cut the posted price in certain stripper areas though other buyers nearby have not met the cut.

Another one, which has a published gathering tariff of 10 cents, buys at the lease tank at some other company's posted price ($3.05) "less 15 cents." This grosses it 25 cents per barrel for its buying and gathering services.

**Trucker policies . . .** Truckers' practices vary. They usually charge 25 cents per barrel for hauling.

Some of them pay the posted price and deduct 25 cents for hauling; others pay 25 cents under the posted price. The only difference is in the way the books are kept—and in the base for paying the gross production tax.

When trucked oil is delivered directly to a refinery or to a tariff point of a trunk pipeline, the crude is usually 10 cents per barrel cheaper because it has incurred no pipeline-gathering charge.

Thus Kerr-McGee points out that trucked oil is the most desirable crude a refiner can get.

**Kermac's position . . .** In letters to OIPA and to local newspapers, Kerr-McGee makes these points in defense of its practice:

**. . . In view** of the current oversupply of oil, Oklahoma crude must be competitive in price, and price includes all costs of getting it to refiners who will use it.

**. . . The operation** of a pipeline gathering system in a stripper-well area where output per well is very low is a costly and generally a marginal proposition.

**. . . If the Oklahoma** Corporation Commission were to set gathering charges that would be compensatory by the usual public-utility rate-base methods, the rates would be much higher than Kerr-McGee is now charging.

**. . . If producers** would prefer a cut in the posted price of crude in the stripper areas, Kerr-McGee would be pleased to oblige.

**. . . If the producers** prefer to truck their oil to market rather than pay a pipeline gathering charge, Kerr-McGee could save money by abandoning the money-losing parts of its gathering system.

**It isn't simple . . .** So far the Oklahoma producers haven't come up with a solution other than to suggest that "there ought to be a law" and to request a study by state officials.

At a mass protest meeting last week they kicked around several ideas.

Some thought a cut in crude prices would be preferable to the gathering charge, but others cautioned against encouraging buyers to lower postings.

Some thought a producer should be able to post his own wellhead price individually, but this was said to be illegal.

Some suggested that producers should form cooperatives to own gathering systems and find refinery markets for their crude, but others warned that this would be asking for even more headaches.

All agreed that the surplus of crude is causing many changes in the old ways of doing business. But they don't like it.

# Gas Spending Setting Records

THE nation's gas industry will spend a record $2.233 billion this year, including the first billion-dollar year for the transmission segment of the business.

The previous industry peak was $1.772 billion set in 1957. Last year the industry spent $1.728 billion, according to the annual study prepared by the American Gas Association.

Still bigger capital outlays are expected in the next 3 years. By 1963 AGA forecasts expenditures of $2.38 billion. For the 4-year period through 1963, investment in new facilities is expected to be $8.4 billion, almost 27% more than the $6.7 billion for 1956-59.

The billion-dollar outlay in gas transmission this year compares with $694 million for 1959.

Gas pipelines are expected to spend $3.5 billion in the next 4 years compared with $2.9 billion for 1956-59.

Some $724 million will be spent this year for distribution facilities, an increase of 12.6% over last year's record $643 million. The forecast for 1963 distribution spending is $790 million, boosting the 4-year total to $3 billion or 30% more than the $2.3 billion spent in 1956-59.

Production and storage will account for spending $354 million in 1960, compared with $306 last year. The study underlines the growing importance of underground storage to meet peak winter demands. This year $87 million will be spent for this purpose. During 1960-63, the underground storage investment will be $466 million, according to AGA forecasts, almost 73% above the 1956 59 figure of $270 million.

## Resid to Be Short

### . . . if imports don't rise, research group concludes.

A RESIDUAL-FUEL-OIL shortage next heating season is forecast by East Coast importers unless fourth-quarter quotas are at least 560,000 bbl. daily.

The quota supported by the Petroleum Industry Research Foundation, Inc., New York, would be a 29% increase over comparable residual imports in 1959.

The foundation forecast a decline in residual stocks during the third quarter which is against the seasonal pattern. It cites June-September import quotas which are 15% below the period a year ago, an expected rise in demand, and a decline in domestic supply.

Therefore the foundation says stocks already below normal at the end of June will decline to the point that fourth-quarter residual requirements must be met entirely from new supplies.

Its recommended import level includes 55,000 bbl. daily to build stocks during the fourth quarter to be ready for the January-March peak-consumption period.

About 21% of East Coast heating needs are met by residual oil, and almost two-thirds of this is imported.

## New Tax Bite

### . . . is a threat to Texas gas pipelines in pending suit.

NATURAL-GAS PIPELINE companies operating in Texas may get taken for another tax ride.

The culprit this time is a state gross receipts tax.

If a current court suit determines that gas lines must pay the gross-receipts tax on operations classified as field sales from the gathering system—as recently held by the attorney general—it might cost the gas lines as much as $6,000,000 in back taxes accumulated over the past 20 years.

The important case to test the state action in applying the attorney general's opinion was filed by Colorado Interstate Gas Co. in state district court in Austin. The company already has paid $143,278 in additional gross-receipts taxes under protest. The suit is to recover the money.

If the state wins the suit, the gas-utilities division of the Railroad Commission will demand back taxes from all other operators who may owe them under the attorney general's new interpretation of the law.

# *INDUSTRY BRIEFS . . .*

**Kratter Corp.,** a real-estate investment firm, is negotiating with several Crescent Petroleum Corp. stockholders in a cash offer for stock. Kratter hopes to buy majority interest in Crescent as a diversification move.

**Operations of Canadian Husky Oil,** Calgary, and Husky Oil Co., Cody, Wyo., are being integrated, with Husky Oil as the subsidiary company. Canadian Husky purchased 87% of Husky Oil stock in an exchange of eight shares for nine shares of Husky Oil. The combined operation will have four refineries, three in Canada and one in the U. S., and 500 service stations and bulk plants in addition to exploration, production, and pipeline activities. Husky Oil's Cody refinery is now being expanded to bring capacity to 9,000 bbl. daily. Marketing operations of the two companies parallel each other along the U. S.-Canada border.

**Texota Oil Co.,** Denver, plans to acquire Basin Oil Corp., Evansville, Ind., in a stock-exchange agreement approved by directors of both companies. The deal would be made on basis of one share of Texota for three and a half shares of Basin. Paul H. Farmer, president of Basin, would become supervisor of a Texota division office in Evansville. Basin stockholder approval is still pending.

**Management of Honolulu Oil Corp.,** San Francisco, is making a careful investigation of the possibility of selling or otherwise disposing of the company, President L. A. Cranson has informed stockholders in a special letter. The study was ordered after a number of other companies had expressed interest in purchasing Honolulu.

**American Petrofina, Inc.,** last week bought 28 South Texas gas wells with reserves estimated at 32 billion cubic feet from a group headed by John L. Loeb. The wells, in Hidalgo and Willacy counties, currently are producing about 225,000,000 cu. ft. a month. The purchase was for an undisclosed amount of cash. Harry A. Jackson, Petrofina president, said the transaction would boost the company's gas reserves by about 16% to 232 billion cubic feet and add about 2.7 billion cubic feet annually to its gas sales. American Fina, formed in 1956, currently owns interests in some 2,700 oil and gas wells in Texas and other states.

**The State of Texas,** Atty. Gen. Wilson ruled late last month, cannot extend the principal term of a mineral lease by entering into a unitization agreement.

# India Wants Firms to Match Low Soviet Prices

• The squeeze is on products now, as well as crude prices. The government also wants to scrap world postings as a basis for Indian oil prices.

INDIA is putting pressure on companies for greater price cuts.

The government is pressing for a reduction on product prices that will match low-cost prices offered by Russia. It also is seeking a further price cut on crude imports, over and above reductions already volunteered by the two major marketers, Burmah-Shell and Stanvac (OGJ, July 25, p. 142).

The first shipment of Russian products under a new agreement between the state-owned Indian Oil Co. and Russia's Sovjuzneefteexport is expected to arrive this month. The agreement, signed July 15, calls for shipments of 1.5-million tons, or about 1.1 million barrels of kerosine and diesel oil in the next 3 to 4 years. Imports in the first 12-month period are to average 4,300 bbl. daily of kerosine, and 1,500 bbl. daily of diesel oil. Shipments will rise to 10,000 bbl. daily later.

While 10,000 bbl. daily will supply only a small-fraction of Indian demand of 130,000 bbl. daily, the government is using the low-priced Soviet products as a lever in an attempt to push down existing prices.

One question that remained unanswered last week was whether private companies will market the Russian products, or permit Indian Oil to use their storage and transportation facilities. The government company has neither tank farms, nor a trained marketing staff.

India is dissatisfied with a 16-cents-per bbl. reduction on the cost of imports offered by Burmah-Shell and a cut, believed to be 15 cents, offered by Stanvac.

A third major marketer, Caltex, has not announced any price reductions, but talks are in progress between it and the government.

Complaints from the government over prices are not new. Negotiations with companies have been in progress for 2½ years. But the government has now decided to set up a unilateral committee of government experts to devise a new formula for oil prices geared to some different basis than world postings.

The government also says it has no intention of extending a temporary price formula under which companies have made two product price cuts in the past 2 years totaling $31.5 million per year. The arrangement will end March 31, 1961, after which the government hopes to win even better terms.

Both the Burmah-Shell and Stanvac price reductions on crude imports were made before Russia offered oil to India. The new price on Iranian crude brought in by Burmah-Shell went into effect May 31. Stanvac notified the government of its reduction on July 4, with deliveries to start arriving toward the end of July.

Burmah-Shell explained it refused to buy Russian supplies not because of political bias, but because the company does not consider Russia a healthy competitor.

**Kerosine big product . . .** The Indian consumption pattern calls to mind U. S. demand at the turn of the century. The country is the world's largest market for lighting kerosine, and the second largest consumer in the world for kerosine for all purposes.

The government's third 5-year plan anticipates a demand of almost 47,000 bbl. daily of kerosine by 1966. This compares with a forecast of 36,000 bbl. daily of diesel oil, 31,000 bbl. daily of gasoline, and 41,000 bbl. daily of fuel oil.

The plan officially forecasts a total consumption of 200,000 bbl. daily in 1966. Unofficial estimates place demand at 280,000 bbl. daily by 1965.

# Iraq Petroleum Fights Fee

. . . imposed on tanker loadings at Basra. The company has appealed the 10-cents-a-barrel levy to Premier Kassim.

A TANKER due last week at Iraq's Fao terminal on the Persian Gulf was expected to serve as a test case in a dispute between Iraq Petroleum Co. and the government.

The dispute grew out of an arbitrary loading fee for tankers picking up crude from the Basrah Petroleum Co., an IPC affiliate.

The increased toll was set by Basra Port Authority. It went into effect on July 23. But tankers en route to Fao were diverted, and no ships called at the terminal for several days. The new levy of 79 cents per ton, or about 10 cents per barrel, is more than 10 times the former fee. Basrah Petroleum owns the loading facilities and the port authority is offering no additional services.

A lack of tankers forced a cutback in output at Rumaila and Zubair fields, since the Fao tank farm can handle only about 3 days supply of crude. Shipments from the port average about 240,000 bbl. daily.

IPC has taken its case to Premier Abdul Karim Kassim, and his reaction probably will determine whether the dispute blossoms into a major struggle. The test tanker was expected to reveal how serious the government is in insisting on a higher toll. The levy would cost IPC over $9 million a year. To pass it along in the form of a higher posted price, would make crude from Iraq's southern fields uncompetitive on the Persian Gulf.

Reports from Baghdad say that Premier Kassim warned IPC about reducing production in the southern fields. There was speculation that he might be stirring up a squabble with IPC as a means of restoring his popularity in Iraq.

Iraq production is at an all time high. IPC produced more than a million barrels daily for the first time in history in June, with an output of 1,007,000 barrels daily. This enabled the country to edge ahead of Iran in output for the first time in history.

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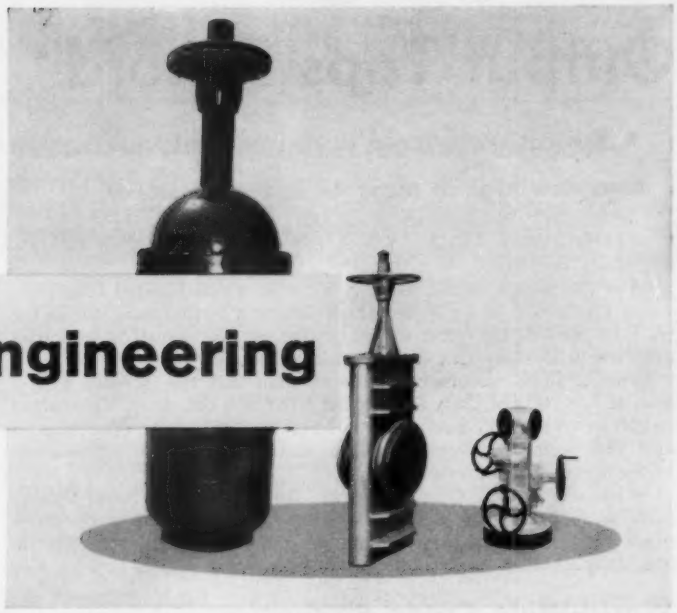
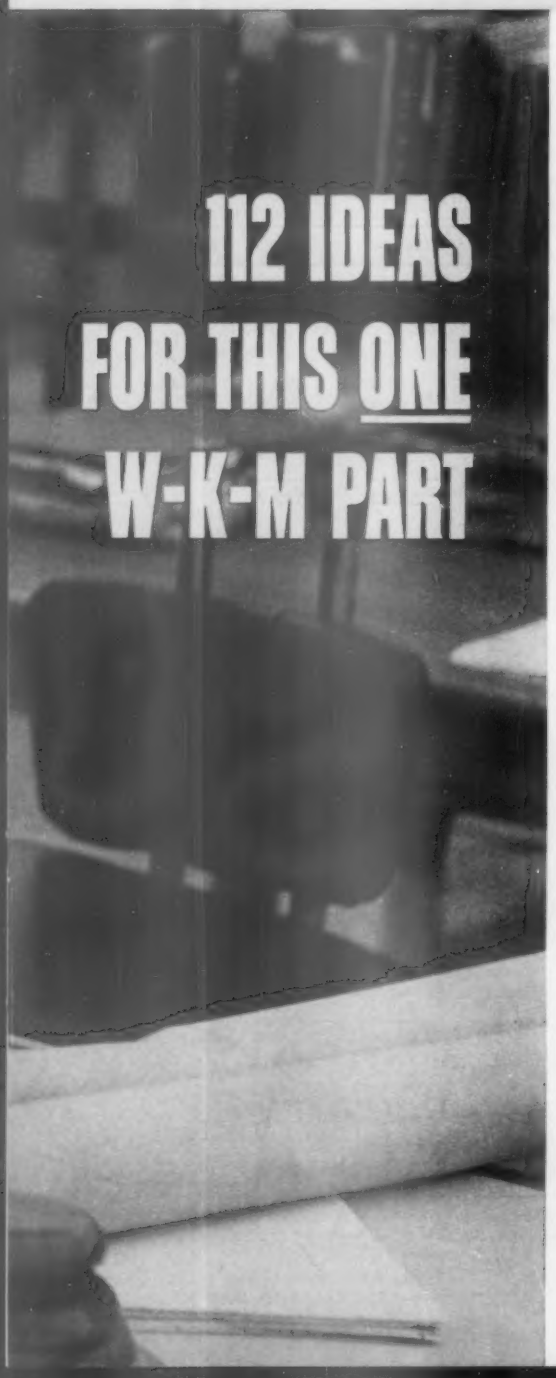


*Left to right above,* W-K-M's new: *Safe-T-Seal* Gate Valve (ASA); Pressure Sealing Gate Valve (ASA); Cross-type Triple Gate Valve (API).



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# Output Tops Record

- **Kuwait, Venezuela push free-world production to a new high in May. U. S. rate is stable.**

PRODUCING AREAS outside the U. S. gained a fat 620,000 bbl. daily in May.

The rise was a record monthly increase which boosted total free-world production to an all-time high despite a virtual standstill in the U. S. It showed the great influence one or two major oil countries can have when they flex their producing muscles.

Kuwait, alone, accounted for more than half the increase with a gain of 328,300 bbl. daily to a record 1,787,600 bbl. daily. Venezuelan output rose 189,600 bbl. daily to 2,905,100 bbl. daily. The Kuwait and Venezuelan increases combined accounted for nearly five-sixths of the free-world increase.

Kuwait's Persian Gulf neighbors, Iran, Iraq, and Saudi Arabia each made gains that in contrast were modest. Canadian operators made up lost ground with a gain of 65,000 bbl. daily to 560,000 bbl. daily.

**TREND OVER THE LAST YEAR**

| | Western Hemisphere less U. S. | Middle East | Total free world outside U. S. |
|---|---|---|---|
| **1959** | | | |
| May | 3,789.8 | 4,618.0 | 9,243.4 |
| June | 4,111.5 | 4,467.9 | 9,428.7 |
| July | 3,914.8 | 4,532.5 | 9,293.2 |
| August | 3,862.1 | 4,659.7 | 9,344.9 |
| September | 3,887.5 | 4,635.5 | 9,396.4 |
| October | 4,069.6 | 4,699.2 | 9,629.8 |
| November | 4,123.2 | 4,820.7 | 9,877.9 |
| December | 4,218.5 | 4,682.0 | 9,861.5 |
| **1960** | | | |
| January | 4,316.5 | 5,065.3 | 10,334.7 |
| February | 4,389.5 | 4,986.5 | 10,313.2 |
| March | 4,156.4 | 5,146.3 | 10,346.8 |
| April | 4,069.5 | 4,925.5 | 10,055.1 |
| May | 4,322.7 | 5,286.3 | 10,675.8 |

## World-Wide Crude Production: Daily Average in Thousands of Barrels

| Country— | May 1960 | April 1960 | May 1959 |
|---|---|---|---|
| **Western Hemisphere** | | | |
| Argentina | 155.0 | 156.1 | 115.2 |
| Bolivia | 8.0 | 8.0 | 8.9 |
| Brazil | 76.0 | 76.0 | 66.5 |
| Canada | 560.0 | 495.0 | 444.0 |
| Chile | 18.9 | 18.9 | 17.4 |
| Colombia | 156.8 | 156.8 | 138.4 |
| Cuba | 0.3 | 0.3 | 0.5 |
| Ecuador | 7.8 | 7.8 | 7.7 |
| Mexico | 263.5 | 263.5 | 265.3 |
| Peru | 52.2 | 52.2 | 47.8 |
| Trinidad | 119.1 | 119.1 | 109.1 |
| Venezuela | 2,905.1 | 2,715.8 | 2,569.0 |
| Total | 4,322.7 | 4,069.5 | 3,789.8 |
| **Europe** | | | |
| Austria | 46.2 | 46.2 | 46.3 |
| France | 38.9 | 37.9 | 30.3 |
| West Germany | 107.5 | 106.8 | 99.8 |
| Italy | 32.9 | 29.0 | 28.2 |
| Netherlands | 35.1 | 35.4 | 34.0 |
| United Kingdom | 1.7 | 1.7 | 1.6 |
| Yugoslavia | 11.5 | 11.5 | 11.6 |
| Total | 273.8 | 268.5 | 251.8 |
| **Middle East** | | | |
| Bahrain | 45.1 | 45.0 | 45.0 |
| Iran* | 983.0 | 974.0 | 983.0 |
| Iraq† | 958.6 | 925.9 | 803.7 |
| Israel | 2.0 | 2.0 | 2.0 |
| Kuwait | 1,787.6 | 1,459.3 | 1,440.2 |
| Neutral Zone | 131.0 | 131.0 | 116.1 |
| Qatar | 149.4 | 171.2 | 168.6 |
| Saudi Arabia | 1,223.1 | 1,210.6 | 1,052.0 |
| Turkey | 6.5 | 6.5 | 7.4 |
| Total | 5,286.3 | 4,925.5 | 4,618.0 |

| Country— | May 1960 | April 1960 | May 1959 |
|---|---|---|---|
| **Other Asia** | | | |
| British Borneo | 107.0 | 107.0 | 107.0 |
| Burma | 10.5 | 10.5 | 11.3 |
| India | 8.5 | 8.5 | 8.5 |
| Indonesia | 420.0 | 426.8 | 340.0 |
| Japan | 10.0 | 10.0 | 7.5 |
| New Guinea | 4.5 | 4.0 | 4.4 |
| Pakistan | 5.9 | 5.9 | 6.0 |
| Total | 566.4 | 572.7 | 484.7 |
| **Africa** | | | |
| Algeria | 132.4 | 126.1 | 16.0 |
| Angola | 1.2 | 1.2 | 0.8 |
| Egypt | 59.0 | 57.6 | 56.9 |
| Gabon | 15.0 | 15.0 | 14.5 |
| Morocco | 2.1 | 2.1 | 1.9 |
| Nigeria | 16.9 | 16.9 | 9.0 |
| Total | 226.6 | 218.9 | 99.1 |
| **Free World** | | | |
| Foreign | 10,675.8 | 10,055.1 | 9,243.4 |
| United States | 7,077.0 | 7,071.0 | 7,220.0 |
| Total | 17,752.8 | 17,126.1 | 16,463.4 |
| **Communist Countries in Soviet Orbit** | | | |
| Romania | 231.0 | 231.0 | 299.0 |
| Russia | 2,850.0 | 2,850.0 | 2,490.0 |
| Other Communist | 100.0 | 100.0 | 60.0 |
| Total | 3,181.0 | 3,181.0 | 2,779.0 |
| **WORLD TOTAL** | **20,933.8** | **20,307.1** | **19,242.4** |

Figures are from reliable industry reports or government sources. Estimates are made where complete reports are lacking. *Includes estimated 6,000 bbl. daily from Naft-i-Shah field not operated by Consortium companies. †Includes estimated 3,500 bbl. daily from Naft Khaneh field, operated by Iraq Government.

# Libya's Second Big Crude Line Is Firmed Up

**• Oasis details plans to serve the Dahra area with a big line to the coast.**

OASIS OIL Co. has applied for permission to build a 300,000-bbl. daily pipeline to the northern coast of Libya.

The proposal calls for an 86-mile 30-in. system from the Dahra area to Es Sider on the Gulf of Sirte.

P. L. Henderson, president of Ohio Oil International of Libya and spokesman for the Oasis group, said Esso Sirte and Libyan American Oil Co. will join the project. Crude produced by the companies in the Mabruk area, on an adjoining concession to the west, will be fed into the 30-in. system via a 36-mile 20-in. feeder line.

A second Jersey Standard affiliate, Esso Libya, is building a separate pipeline system 80 miles to the east, from Zelten field to the Mediterranean Coast.

Oasis is the operator for exploration, production and transportation in Libya for three partners—Ohio Oil, Continental and Amerada. Oasis expects a decision by the Libyan Petroleum Commission in 3 to 5 weeks. If approved, the proposal will then go before the provincial government of Tripolitania.

The Petroleum Commission disclosed the application "with pleasure" and there is little doubt about its approval. The project will cost about $40 million.

**Big capacity . . .** The pipeline will carry up to 300,000 bbl. daily under gravity flow. Pumping stations could substantially increase the capacity.

Crude will be delivered into seven 300,000-bbl. storage tanks at the terminal near Es Sider. Forty-two-in. feeder and 36-in. submarine lines capable of handling upwards of 40,000 bbl. of crude per hour will supply two sea berths in 70 ft. of water about a mile offshore. The water is deep enough to handle the biggest tankers afloat.

Bids have already been submitted by various pipeline construction firms and are under study.

Construction of the line will take from 18 months to 2 years after permission for the project is granted. The pipeline route is virtually a straight line through the desert from Dahra field to tidewater.

The company will continue its development drilling program between now and the opening of the system. Nine oil wells in Dahra have been completed as producers in the 500-11,500 bbl.-daily-range. There also are two gas wells. Three of the 14 Oasis rigs are on development drilling in the field.

**The other line . . .** The new line will be about 80 miles east of a pipeline from Esso's Zelten field to Marsa el Brega and will run almost parallel to it (OGJ, July 25, p. 138). The Oasis line will be laid entirely in Tripolitania while the Esso line will be built in Cyrenaica. Pipe deliveries have already begun for the Esso project (OGJ, July 25, p. 140).

While Oasis's parent companies are carrying on all operations jointly within Libya, they will handle marketing separately. Ohio Oil was the first to disclose definite plans for moving part of its production. It announced a proposed refinery project in Spain (OGJ, July 11, p. 76).

Mabruk oil field has three wells completed for a total of about 2,500 bbl. daily. Esso Sirte is operator in the area under a farmout agreement with Libyan American, which is owned jointly by Texas Gulf Producing and W. R. Grace & Co. Esso is earning 51% interest in the block by matching the investment made by Libyan American.

## *Conoco Buys A Market for Libyan Oil*

CONTINENTAL OIL Co. has stepped into the thick of European marketing by acquiring control of one of the biggest independent marketing organizations in West Germany and Austria.

The move answers one of the leading questions in today's oil industry: How soon, and in what way, will partners in Oasis Oil Co. try to find outlets for big new crude reserves under development in Libya?

Albert E. Ernst, Continental vice president, said the company's subsidiaries have taken control of Sopi Mineralprodukte G.m.b.H. The organization markets petroleum products under the brand name "Sopi" through approximately 360 retail outlets.

Continental announced no immediate plans for refining in Europe, but its Sopi interests will enable it to move part of its Libyan crude to European refineries and take products in trade-out arrangements.

Ohio Oil has proposed a 25,000-bbl. refinery on the northern coast of Spain to be owned jointly with Spanish interests. The third partner, Amerada, has not yet disclosed its plans.

# Major Algerian Field Confirmed

**. . . by 2,000-bbl. well 4 miles from Mobil discovery in French Sahara. It's well inland, but close to a pipeline.**

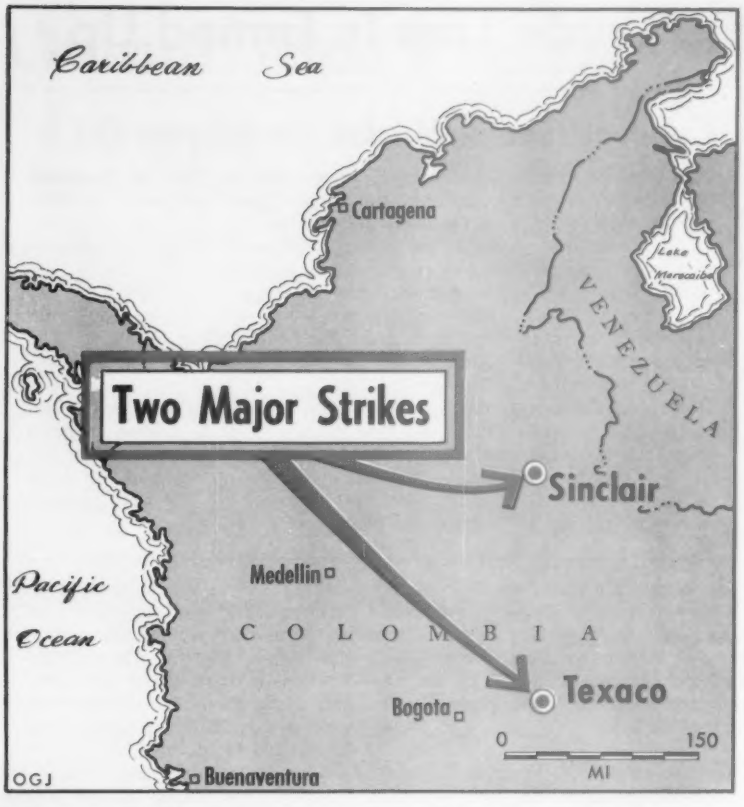
A NEW 2,000-bbl. well last week confirmed what is apparently a new major oil field for the French Sahara and the first in which an American company has an interest.

Mobil International last week revealed successful tests on Ohanet 2 in the southeastern region of the Sahara near the Libyan border and to the north of the Edjele - Zarzaitine fields. The new well is a 4-mile stepout to the north from Ohanet 1, a wildcat completed in April (OGJ, May 2, p. 91).

Ohanet 2 flowed at the rate of 2,000 bbl. daily of 38°-gravity oil through a ¼-in. choke. The tests were made on an 85-ft. pay section of lower Devonian sand found at 7,650 ft. The significant stepout is structurally higher than the discovery, which flowed 1,900 bbl. daily through a 1-in. choke from a zone tested at about 7,740 ft.

The two-well field is about 350 miles south of the Mediterranean Coast but only 30 miles to the west of the 24-in. Edjele pipeline, which will go into operation this fall moving French-Shell oil 460 miles north to a Tunisian seaport near Gabes.

The new find makes African oil increasingly important to Mobil. The company is earning a 25% interest in the 8.7-million-acre block on which the Ohanet wells are located. The block belongs to Cie. d'Exploration Petroliere (CEP), French-government controlled exploration company which is the operator.




# Rigs Hit Twice in Colombia

**• One strike is in the middle Magdalena Valley and the other taps the Andes foothills for the first time.**

TWO WIDELY separated discoveries have given Colombian exploration the biggest boost in years.

Sinclair Colombian Oil Co. made one of the finds of middle Magdalena Valley. The successful wildcat is the first discovery ever made by Sinclair in Colombia. The other well was brought in by Texaco in the Llanos. The well is the first strike in the foothills of the Colombian Andes.

Sinclair's Santos 1 has been completed as a producer from two zones. The well will go on commercial production as soon as an offtake line is completed. The deeper pay is from 8,992 ft. The zone reportedly flowed 570 bbl. daily on a 3¾-hour test through a 5/64-in. choke. Gas-oil ratio was 1,800 : 1. Crude from the pay is 37.6°-gravity.

The same zone flowed 1,600 bbl. daily on a 4½-hour test through a 23/64-in. choke. Flowing pressure was 1,700 psi. and the gas-oil ratio 900 : 1. The pay flowed 2,500 bbl. daily on a 1½-hour test through a 34/64-in. choke with a gas-oil ratio of 900 : 1.

Further up hole a 30-ft. section from 8,809-39 ft. flowed 1,644 bbl. daily of 36°-gravity oil on a 4½-hour test through a 23/64-in. choke. Gas-oil ratio was 1,150 : 1 and the flowing pressure 1,750 psi.

The Santos find is about 34 miles northeast of Barranca Bermeja on a 215,060-square-mile concession held jointly with International Petroleum (Colombia) Ltd. Sinclair is the operator. British Petroleum Co., which has a long-range joint operation agreement with Sinclair in Latin America, does not have an interest in this particular venture.

The discovery reportedly is on the up-fault side of the structure. A Sun Oil subsidiary, which formerly had a farmout on the acreage, drilled a dry hole on the down side of the fault about a year ago. A third zone from 9,560-90 ft. tested dry. The best pay initially tested gas on a 15-minute test. The interval was squeezed, cemented and on retesting flowed oil. The first stepout is already drilling.

**Llanos find . . .** Texaco broke the ice in the Colombian Llanos with a discovery in Guavio 1 located about 65 miles east of Bogota on Block 44.

The discovery was completed as a dual producer. A 24-ft. section of Oligocene from 6,890-6,914 ft. tests 438 bbl. daily of 37°-gravity crude through a ½-in. choke. The deeper pay is a 56-ft. section of Eocene from 7,672-7,728 ft. It tests 342 bbl. daily of 39°-gravity crude through a ⅜-in. choke.

Another test of an Oligocene section at 4,900 ft. was dry. The find is 500 miles from Caribbean tidewater, and much more drilling may be needed to determine whether it is worthwhile commercially. The wildcat is the first to be drilled in the Llanos foothills. Other operators have drilled 30 dry holes in the plains area.

Texaco has invested $2 million in the Guavio well so far. The rig was flown to location in an airlift organized by Loffland Brothers. More than 200 tons of gear were carried with the largest units weighing 5 tons.

# Wildcat on Timor

**. . . is planned near one of the island's oil seeps.**

A WILDCAT program on the island of Timor in the Southwest Pacific will be resumed in September by an American company and its Australian partner.

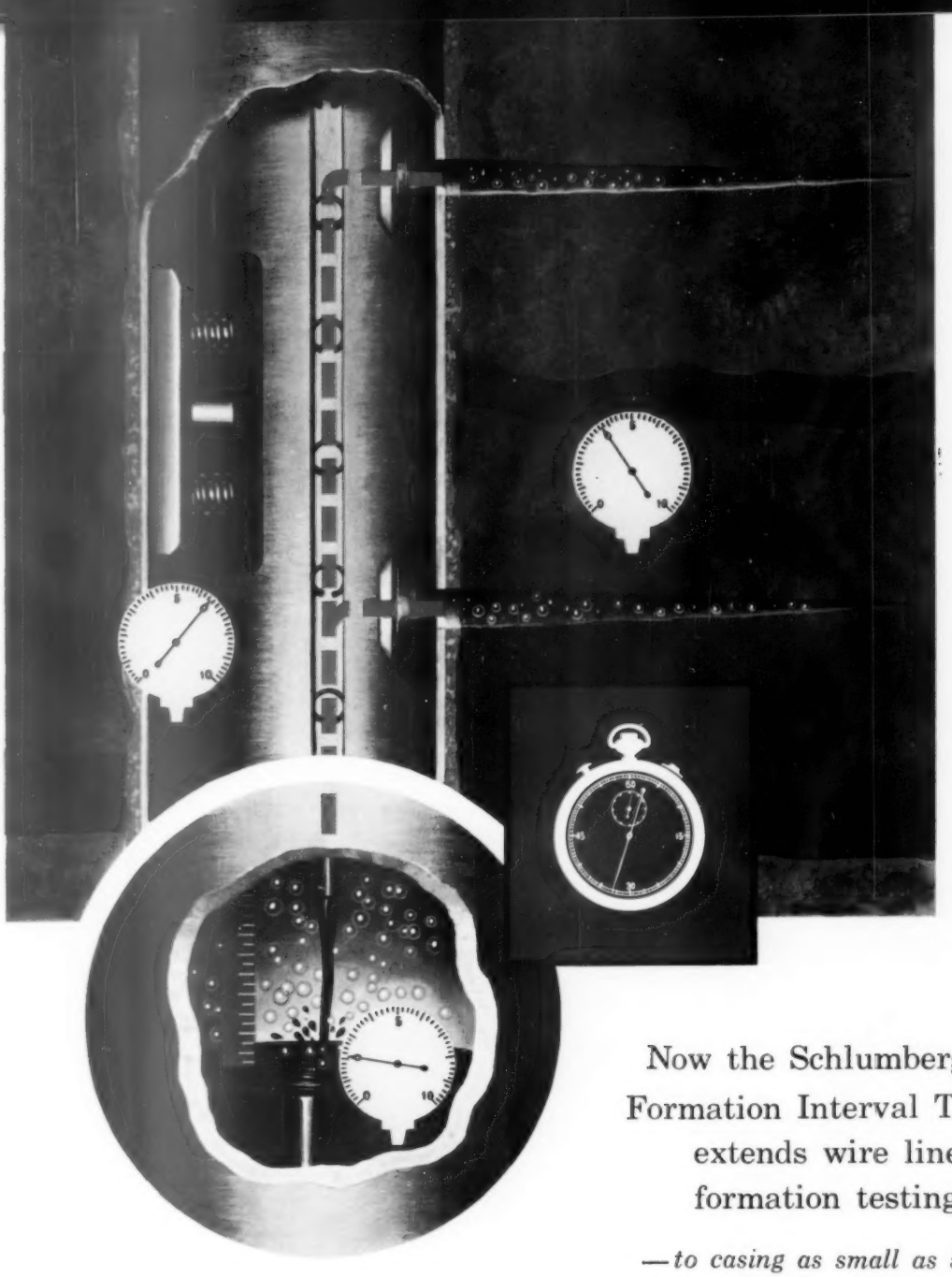
Two dry holes were drilled on the island last year by Tradewinds Exploration, Inc., Denver, and Timor Oil, Ltd., an Australian firm. The two companies hold a concession on 7,000 square miles in Portuguese Timor, which is the eastern half of the island (OGJ, August 10, 1959, p. 78).

The new test will be drilled near an oil seep which produced an average of 12 bbl. of oil daily under a government-supervised 90-day test. The site is near the south coast of the island at the village of Matai.

Pohly Exploration Co. of Tulsa says the Matai seeps are on top of a structure with approximately 500 ft. of closure. The two dry holes were drilled about 75 miles west of Matai near seeps in the Ossulari section of the island.

The third wildcat will be drilled to the Mota Bui limestone (Triassic) at about 5,000 ft. It will drill through Tertiary sands to reach its projected depth.

The island of Timor lies off the northwest coast of Australia between Java and New Guinea. Tradewinds, which is partly owned by Sunset International Petroleum Corp., holds 45% of the Portuguese Timor concession.



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**HOMEMADE WIDE BASE** and timber foundation can be used to reduce the high cost of unit pumper installation. This is a 228,000-in.-lb. unit. Gravel is frequently used around the timbers to prevent shifting of the load. This is only one example of several in this article that will show you that . . .

4 CURRENT DEVELOPMENTS IN **OIL WELL PUMPING**

1. Right Foundation Can Cut Costs.
2. How to Weigh Dual Pumping Wells.
3. Pumping Loads With Hollow Sucker Rods.
4. High-Volume Pumping on Nonprorated Leases

# 1. Right foundation can cut costs

- At least four different pumping-unit supports are in use. Each has its advantages, and each its drawbacks. Local conditions are important in determining company policies.

BY W. B. BLEAKLEY
Production Editor

A FEW YEARS AGO, a standard poured concrete foundation was automatically set for each pumping-unit installation.

Reason for this is that the crank and counterweights required clearance above the ground. The units were built with a foundation in mind, and the crank frequently went below the base of the unit.

Then the floor-clearance models came along, followed by a lot of other changes, mostly in the habits of operators trying to find ways to save a dollar here and there.

This evolution has resulted in the acceptance by various companies of at least four ways to set a unit:

- Standard poured-concrete foundation.
- Portable concrete foundation.
- Universal concrete foundation.
- Gravel-and-timber foundation for skid-mounted units.

**Which is best?** This is an impossible question to answer. There is no universal agreement among operators, and there is no standard test that can be applied. But let's look at some of the advantages of each.

**Poured concrete.** This has been the standard of the industry for years, and a hard one to beat. It provides a massive support for the heavy machinery of the pumping unit. It has sufficient strength and rigidity to prevent movement of the unit. If the foundation is properly laid out, alignment of the unit is automatic because of the bolt holes. It can be made locally from prints furnished by the manufacturer, using local labor, and a local cement contractor. Once the proper unit has been chosen for the well, the foundation is poured to the required specifications.

**Portable concrete foundation.** These are shop-made foundations that can be moved to the well site and set in place on leveled ground, or in a shallow excavation. They are made of prestressed reinforced concrete, and provide the same massive support as the poured foundation.

Big advantage of the portable base is its portability. When a lease is abandoned, or if a smaller or larger unit is needed to meet changing well conditions, the base may be moved to another location and a new one substituted.

Lightweight aggregates can be used where specified, making the foundation still easier to move.

Quoted prices on the foundations include mounting bolts that are factory installed.

**Universal concrete foundation.** This

**FACTORY-MADE WIDE BASE,** with a gravel-and-timber foundation provides enough support to handle this 640,000-in.-lb. unit. Gross weight of this installation is about 77,000 lb., including engine.

**CONVENTIONAL POURED-CONCRETE** foundation is used for this 228,000-in.-lb. unit in Ector County, Texas. Shop-built subbase permits construction of simple slab-type foundations.

type consists of a concrete slab, usually poured in place, but may be prefabricated. With this type of foundation, the beam unit is usually secured with a center holddown arrangement. The bolt holes in the base of the unit, provided for a standard poured foundation, are not used. The unit is tied down along its center line.

The "fits-all" type of base is preferred by several major operators. It is constructed usually with a piece of heavy drill pipe cast into the concrete along the longitudinal center line. The drill pipe is exposed at frequent intervals along its length so that U-bolts can be used to hold down the pumping unit (OGJ, Dec. 10, 1956, p. 139).

Big advantage here is that the center-line tiedown permits the same base to be used for different-sized units, within a limited range of sizes. If the base is prepared for a given unit, it frequently will accommodate units that are one size larger and one size smaller.

As in the standard poured foundation, this type is massive and can be fabricated on the job with local labor and materials.

High speed operation of a pumping unit requires a good, solid, foundation, and the unit must be securely anchored. While slow operation is always best, there are many cases where wells are being pumped at speeds that may mean lots of trouble. In this case only a concrete foundation of one type or another should be considered.

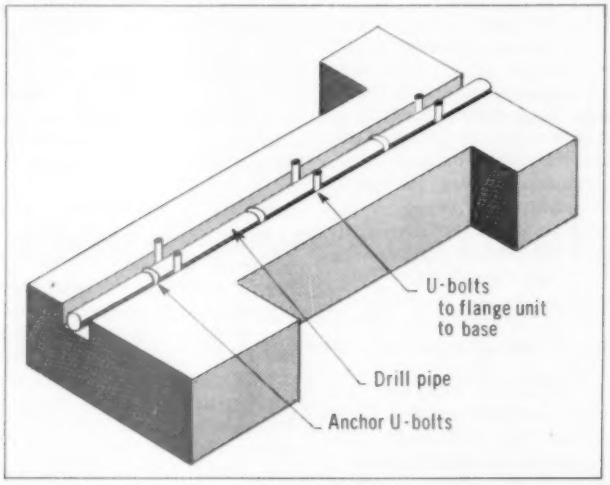
Also, in the case of multiple completions, where the units are "butting heads," a secure foundation is needed because the small clearance between units prohibits even the slightest movement of either unit.

**Gravel and timber.** This is not so much a foundation as it is a pad. Experience on the railroads showed that heavy timbers with gravel ballast will stand up pretty well even with vibratory loads. Someone tried it on pumping units and it works.

There are a couple of big advan-

**ONE PLACE** where a solid concrete foundation is needed. Poured, portable, or universal types are satisfactory, as long as there is no shifting of the units. Clearance at the rod hanger is too small to tolerate movement.

**HERE'S A GOOD EXAMPLE** of a center tiedown installation. A universal poured or portable foundation is used, and U-bolts anchor the unit to the foundation. Pipe crossbars along length of unit permit alignment over wellhead.




**SCHEMATIC** of a typical universal-type foundation. The exact size and shape of this foundation can be changed to suit individual cases. A piece of heavy drill pipe is anchored to the foundation and the unit, in turn, is attached to the drill pipe with U-bolts. Advantage is that more than one size unit can be used as well conditions change.

tages. First, all materials that are needed can usually be found locally even in some remote locations. Secondly, when it is time to abandon the lease there is practically nothing to do. Remove the timbers, get rid of the gravel (plow it under, bury it in a hole, or spread it on a farm road), and restore the lease to the original contours. No blasting, no heavy chunks of concrete to haul away or bury.

Another advantage is that the units supplied for this type of installation come equipped with a wide base, more or less skid mounted, and can be easily picked up and moved from one location to another if necessary. And a different-sized unit can be moved in to take its place, as well conditions require.

Another important advantage here is that the wide base provides a universal prime-mover mount. Either gas engine or electric motor can be installed with no additional support.

### Disadvantages

So far the advantages have been the only feature mentioned for each type of base considered. But every type has its drawbacks.

**Poured-in-place base.** This type fits only one size unit, and lacks the versatility of other bases. It must be removed from the lease at abandonment, or when a different-sized unit is needed, usually by blasting. Removal may be made easier by providing the base with demolition holes when it is poured.

Price goes up when the location is remote. Ready-mixed concrete gets expensive away from the plant. Even with on-site mixing, remote locations can mean long-distance hauling for sand and gravel as well as for dry cement.

**Portable concrete foundations.** Biggest disadvantage here is freight cost. Whether the base is ordered direct from the factory, or through a local supply house, there is a freight charge. So far as is known, these bases are made at only two points in the oil country; one in Kansas and one in West Texas. While these two locations are close to a lot of pumping wells, they may not be as close as the nearest ready-mix plant.

**Universal concrete foundation.** Initial cost and expense of removal are the two main objections here. These are offset somewhat by the fact that different sized units may be used on this type base, lengthening its life.

**Gravel and timber.** Main objection to this type of foundation, by some operators at least, is the fact that the unit is not tied down. This means that shifting is possible and that misalignment might result.

One manufacturer of pumping units has stated that the company does not recommend the gravel-timber type of base because any shift in the position of the unit means that loads are imposed on the beam bearings that are not according to design conditions. That is, misalignment of a unit may mean that a simple bronze sleeve bearing will be subjected to thrust loads, etc.

On the other hand, one major operator reported that units as large as 640,000 in.-lb. have been successfully placed on gravel and timber with no apparent trouble (see photo). Other operators are using this type of base for all but their largest units.

A second disadvantage of the gravel foundation is that a wide base must be used on the basic unit. This is available from the unit manufacturer to fit the unit, and is an extra-cost item. Or it can be made in the field from surplus or scrap drill pipe.

Some operators have expressed an opinion that the gravel-and-timber base should not be used if the unit is powered with a single-cylinder, internal-combustion engine. Reason is the natural vibration that this type of en-

**PORTABLE CONCRETE FOUNDATION** supports this 57,000-in.-lb. unit. The basic foundation is that portion shown above ground level. Other concrete areas are included for convenience and appearance.

gine imparts to the supporting structure. If any shifting occurs, the operators tend to blame it on these vibrations, and claim that a change to multicylinder engine or electric motor has stopped the shifting.

### How to Decide

All operators are fighting high costs. Logically, then, the type of foundation to use for a pumping unit is the one that will do the job well at the least cost.

To arrive at some basis of comparison, an informal Journal survey was conducted to find the various costs associated with the installation of a 160,000-in.-lb. electric - motor - driven unit at Great Bend, Kans. This is a hypothetical job, of course, and it must be realized that all costs will vary with location and make of unit.

Price quotation was obtained from the manufacturer of a well-known brand of pumping unit, with and without a wide base, f.o.b. Great Bend. The cost of a delivered portable concrete foundation was obtained from a Kansas manufacturer, and the cost of 3,000-psi. ready-mix concrete, delivered to a point 5 miles outside the Great Bend city limts was determined to be $14.20 per cubic yard.

Using these data as a starting point, the costs in Table 1 were determined. These figures include some estimates that are believed to be representative, but do not include the labor charge to assemble the delivered unit and to put it in operation. This cost would be the same for all types of installations.

The information in the table reflects the opinions expressed by several operators: that the cost of the different bases is about the same, **up to the first move.** There is one possible exception to this, and it increases the attractiveness of the portable unit. If an electric motor is to be used, this can be supplied to the pumping-unit manufacturer at the time the unit is ordered, along with the necessary sheaves, belts, etc. The manufacturer will usually install this equipment in his shop at little or no cost. This reduces the amount of time and money spent at the well site.

Table 1 is not all-inclusive. Not mentioned is the field-made wide base. This type can be fabricated out of scrap drill pipe, welded on the well site, and put in place at reasonable cost if there is a welder on the payroll. One operator listed the cost of such a base at $120, not including the motor mount and belt guards. This base was made of 4½ in. drill pipe.

Also missing from the table is a cost breakdown of the universal type of poured-concrete foundation. It is estimated that the first cost of this type would be about the same as the conventional concrete base, and the cost of abandoning the lease would also be about the same. In making a choice, the advantages mentioned earlier must be considered.

## Table 1—Cost of Setting a 160,000-in.-lb. electric-motor-driven unit (in Great Bend, Kans.*)

| | (Type of Base) Poured concrete | Portable concrete | Gravel-timber |
|---|---|---|---|
| Unit price delivered | $5,828 | $5,828 | $6,226† |
| Foundation | 550‡ | 583§ | 285¶ |
| Total | $6,378 | $6,411 | $6,511 |

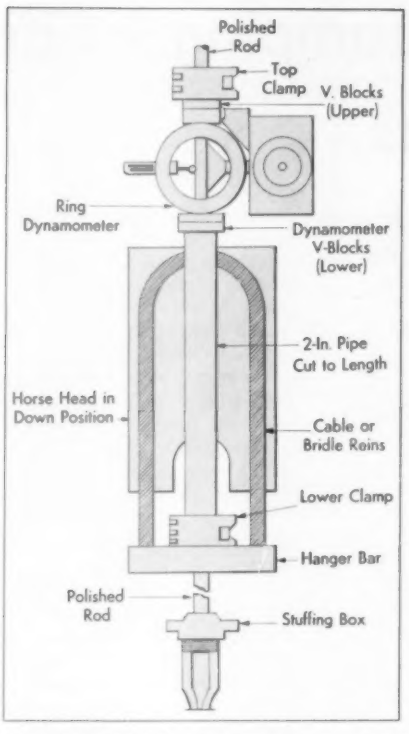
*Does not include cost of local assembly of unit and rigging up.
†Includes factory-built wide base, delivered.
‡Includes 11 cu. yd. of concrete at $14.20, poured in prepared forms, with foundation bolts, and the unit grouted in place.
§Includes delivered price of pre-cast base ($483) plus estimate of cost of site preparation and setting unit in place.
¶Estimated cost of timber and gravel plus site preparation, and setting of unit.

### Conclusion

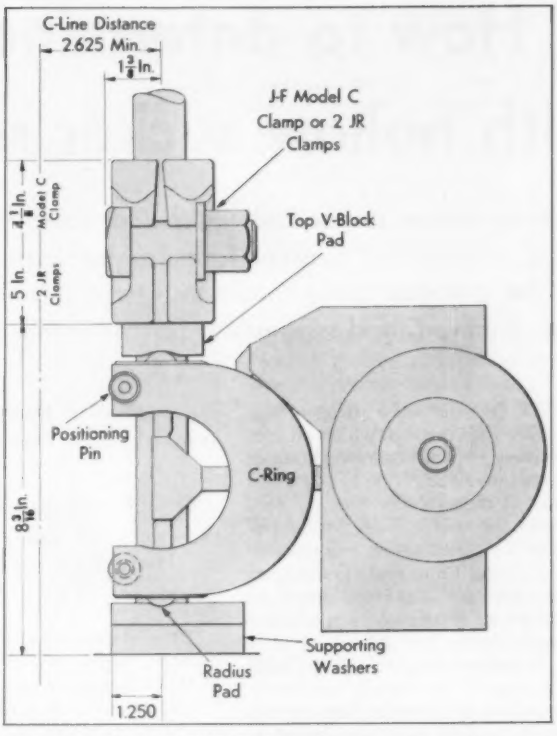
If popularity is any yardstick, the wide-base unit with a gravel-and-timber foundation is the best. Most small operators that were questioned listed this as their first choice. Among the majors, practices vary with some going to the portable-type unit and others sticking to the poured-concrete foundation to help meet changing well conditions with the least expense. In general, these suggestions will apply:

- If the well has a long life, with high loads that will remain constant, a poured foundation should be used.
- If the well has a long life, and the producing characteristics are expected to change slightly, a universal-type foundation is probably best.
- If the well has a medium to long life expectancy, high well loads, with the possibility of a decided change, a portable concrete foundation may be best.
- If the well has a short, or unknown life expectancy, where the loads are not too great, and where a change is indicated, the wide-base unit on a gravel-timber foundation is probably the most economical.

These suggestions are meant to be only suggestions. Every company has its own policies, and there are too many variables involved to permit drawing up any hard and fast rules.




**HEAD-ON VIEW** shows how a conventional dynamometer is used with a polished-rod extension to weigh one of two dual wells. Fig 1.




**IMPROVED DYNAMOMETER** for close-quarter work uses a C-ring instead of the usual O-ring as a strain measuring device. New tool provides ample clearance for dual pumpers. Fig. 2.

# 2. How to weigh dual pumping wells

**With two polished rods operating on about 3-in. centers, the problem of weighing a pumping well becomes a mechanical nightmare. Here are two ways to get the job done, without pulling a polished rod.**

BY JOE CHASTAIN
Midland, Tex.

INCREASING popularity of dual completions has been accompanied by an increase in operating problems. One of these is the problem of trying to get dynamometer cards from dual pumpers. Two methods are described here, one using the conventional ring-type dynamometer, the other a newly developed C-ring dynamometer.

**Use polished-rod extension.** One installation can be made by putting an extension on the polished rod so that the rod extends above the horsehead on the downstroke. A piece of 2-in. pipe is cut to suitable length and slipped over the rod to rest on the polished-rod clamp. The ring-type dynamometer is clamped to the rod above the 2-in. pipe, and the clamp below the pipe is loosened so that the load is transferred to the pipe and the dynamometer, Fig. 1.

The author is publisher of the book "Pumping Well Problem Analysis."

When all this has been done, the string is secured to the stuffing box, the paper is put on the drum, and the unit is set in motion.

In the interest of safety, the unit should be shut down before the chart is removed.

**Here's a new tool.** A recent development by Johnson-Fagg Co. has made direct weighing of wells possible. It is a C-ring dynamometer, and it provides enough clearance so that a dual pumper can be weighed without difficulty.

Dimensions and method of installation of the new tool are shown in Fig. 2. It can be seen that it is possible to weigh a well having a centerline distance from a companion well of only 2.65 in. Earlier models extended so far from the rod that the dynamometer interfered with the rod of the companion well. This new C-ring unit can be used in the field by only one man, with a minimum of time required to do the job. It is suggested that the well not being weighed be shut in while weighing is in progress, and that the horse head be in the down position.

Field experience so far has shown that the accuracy of the new unit is equal to that of the old reliable ring-type dynamometer.

In the event that the companion well polished rod is too long and may strike the moving dynamometer, it may be necessary to tie the idle rod back away from the active area. No damage to the rod will result, because it need not be bent enough to provide clearance.

**Save money, time.** Using either of these methods will save money and time in weighing wells. They eliminate the need for a pulling unit to remove the idle polished rod, and in case there is trouble to trace, the pulling unit could be tied up for several hours, waiting on a standby basis to install the rod and get the companion well back on production.

# 3. How to determine pumping loads with hollow sucker rods

**• Using hollow sucker rods in a dual role, as rods and tubing, means that present formulas for load calculation must be changed to fit conditions. Here is an analysis of forces involved, and suggestions for rod-string design.**

BY G. R. McDANNOLD
Vinson Supply Co.

PROPER DESIGN of a string of hollow sucker rods through which oil is to be produced depends on recognition of the forces involved.

Some of these forces are: (1) dead weight of the rods, (2) dead weight of the fluid, (3) acceleration and deceleration, (4) total fluid, and (5) mechanical friction. All of these forces are present to some degree in a reciprocating rod string, and the sum of these forces constitute the polished-rod load.

**Derivation of formula.** Since pumping with hollow rods is similar to pumping with solid rods in fundamental respects, Mills' formula[1] can be altered to reflect conditions found in hollow rods.

Presented at the seventh annual West Texas Oil Lifting Short Course, Texas Technological College, Lubbock.

Mills' formula is:

$$PL\ (max) = W_f + W_r\,(1 + N^2L/70{,}500) = W_f + W_r\,(1 + C) \quad (1)$$

where:

PL = polished-rod load, lb.
$W_f$ = weight of fluid, lb.
$W_r$ = weight of rods, lb.
L = length of stroke, in.
N = s.p.m.
C = $N^2L/70{,}500$, called the acceleration factor.

This formula as shown here can also be applied to pumping through the annulus when using hollow rods.

The formula does not take acceleration of the fluid into account. This is due to the fact that the pump displacement is small compared with the volume of the annulus, and also due to the slow rate of stress transmission of the fluid. Consequently, the oil is not moved very far.

However, with hollow rods being used both as rods and tubing, all the oil in the rods is accelerated once the traveling valve closes on the upstroke, so the formula should be changed to:

$$PL\ (max) = (W_f + W_r)\,(1 + C) \quad (2)$$

The factors in the formula all remain the same except $W_f$, which now becomes the weight of the volume of oil inside the hollow sucker rods (inside area × pressure gradient × depth). For this reason, the maximum polished-rod load is not affected in any way by the size of the pump.

The minimum polished-rod load for a solid sucker rod string is:

$$PL\ (min.) = W_r\,(1 - C) - W_r\,62.5/490 \quad (3)$$

The last factor in this equation is the bouyancy of the rods. When the annulus is vented while producing through hollow sucker rods, the buoyancy factor is nearly zero. (Actually, the working oil level in the annulus will provide some buoyancy.) Then:

$$PL\ (min.) = W_r\,(1 - C) \quad (4)$$

**Analysis of geometric conditions.** When the rods start the downstroke, three different conditions can exist depending upon the size of the plunger and rods: (1) if the plunger diameter and hollow sucker rod internal diameter are the same (Fig. 1), the weight of the column of oil rests on the standing valve and the net weight of the oil on the rods is zero; (2) where the internal diameter of the rods is greater than the diameter of the plunger, part of the column of oil (area of plunger × pressure gradient × depth) rests on the standing valve and the balance rests on the sucker rods, Fig. 2. Since this balance of weight is moving downward, it should be decelerated the same as the rods, and (3) where the diameter of the plunger is greater than the internal diameter of the rods, all of the weight of the oil in the rods and pump is supported by the pump standing valve. However, a force, (area of plunger − internal area of rods) × pressure gradient × depth resists downward movement of the rods. This force will displace fluid

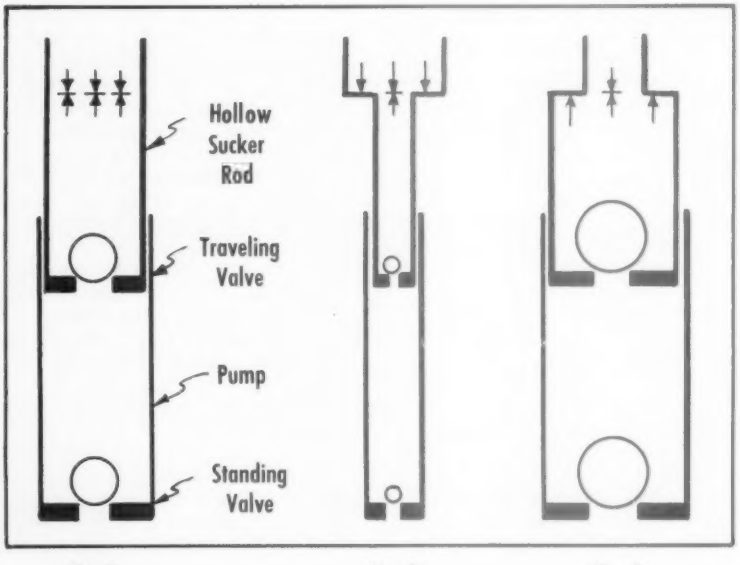
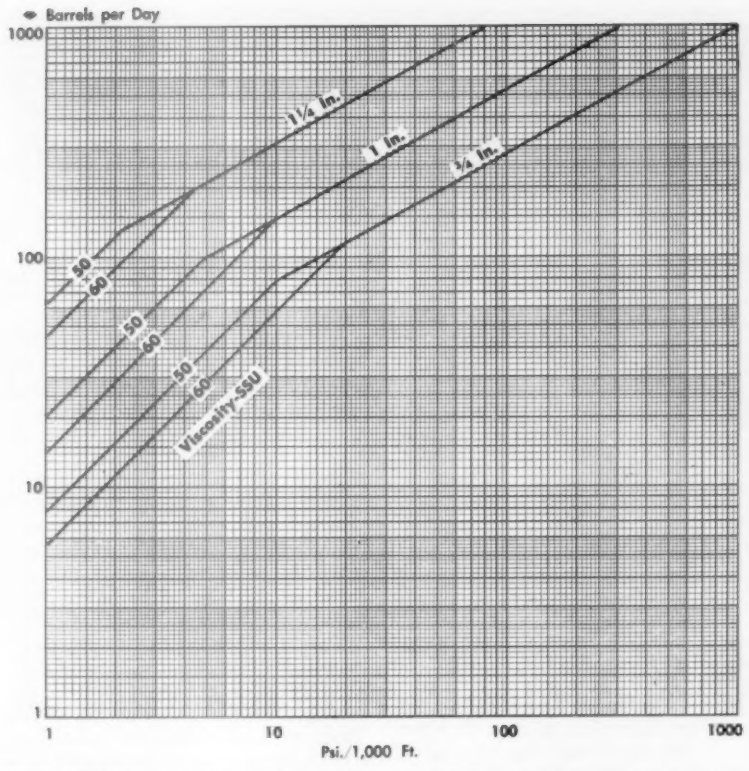



Fig. 1 Fig. 2 Fig. 3

**DISTRIBUTION** of oil and rod load on the downstroke depends on the relative diameters of the rods and the pump plunger. Text describes the conditions for these three cases: (1) plunger diameter and rod internal diameter the same, (2) internal diameter of the rods greater than the diameter of the plunger, and (3) internal diameter of the rods less than the diameter of the plunger.




**PRESSURE LOSS** in hollow sucker rods per 1,000 ft. of length, and the various producing rates is shown here for different rod sizes. Fig. 4.

which must be accelerated upward by the weight of the rods.

By using the following formula all these conditions are satisfied.

$$PL\ (min.) = W_r\ (1 - C) + (A_r - A_p) \times P.G. \times D \times (1 \pm C) \quad (5)$$

where:

$A_r$ = internal area of rods, sq. in.
$A_p$ = area of plunger, sq. in.
P.G. = pressure gradient of fluid, psi. per ft.
D = depth of pump, ft.

Note: When the plunger diameter is larger than the internal diameter of the rods, "C" in the second portion of this equation is positive (+). It is negative (−) when the plunger diameter is smaller than the internal diameter of the rods.

Rod-string design charts, similar to those used for solid rods, are available for these hollow sucker rods.

**Fluid friction.** Another factor, should be considered—friction of the oil passing up through the hollow sucker rods. With conventional rods this is not considered, as the friction up the annulus is relatively insignificant. It is also relatively insignificant for hollow sucker rods at average rates of production (100 bbl. per day for ¾-in. and 200 bbl. per day for 1-in. hollow rods), but at higher rates of production it becomes a factor. The following formula is suggested:

$$PL\ (min) = W_r\ (1 - C) + (A_r - A_p) \times P.G. \times D \times (1 \pm C) - F \quad (6)$$

where:

$F = P \times D \times A/1{,}000$

where:

P = pressure drop per 1,000 ft. of oil at 3.136 × barrel per day rate.
D = depth, ft.
A = internal area of hollow sucker rods, sq. in.

Since oil is pumped only on the downstroke, the pressure drop per thousand feet must be calculated at twice the daily producing rate. Also, the speed of the polished rod is greater when at the halfway point of the downstroke. This is due to the angular velocity of the crank arm. The speed of the polished rod at this point is 1.568 times the average speed. The constant 3.136 comes from 2 × 1.568.

By multiplying 3.136 by barrels per day, the corrected maximum producing rate is found. The pressure drop per thousand feet is found from Fig. 4, using the corrected barrels per day rate.

**Mechanical friction.** This is the force created by rods rubbing against the casing. With solid sucker rods, it is ignored since all the rods are assumed to be in tension on both the upstroke and downstroke.

With hollow rods, this can also be assumed except on the downstroke when the plunger diameter exceeds the internal diameter of the rods. When this condition exists, there is a force, represented by $(A_r - A_p) \times P.G. \times D \times (1 + C) - F$ in the minimum polished-rod formula, which resists the downward movement of the rods. It is directly proportional to the plunger size. This resistance to fall of the rods could cause the lower portion of the string to bend out and contact the casing walls thereby creating mechanical friction. Since it is impossible to calculate its magnitude at the present time, it is left out of the formula. Time and experience may give us the answer to this force, and it is believed that rod guides or centralizers will minimize this force even when using large-diameter plungers.

**Application of formula.** A modified Goodman's diagram has been prepared, Fig. 5, for continuous weld, J-55, and N-80 hollow rods. This diagram was devised in the same manner as one proposed by A. A. Hardy[2] for solid sucker rods. It actually gives a four-to-one safety factor over the fatigue endurance limit as determined by rotating beam test. Maximum range of stress in this diagram was set at approximately 37% minimum yield.

Maximum and minimum stresses may be calculated by dividing the polished-rod loads by the area of metal in the body of the hollow sucker rods. Calculated minimum stress is plotted in Fig. 5 on the minimum stress line. Calculated maximum stress is plotted vertically above the point. The maximum stress line just above the maximum stress point is labeled with the grade of steel required to meet the requirements of this pumping problem.

Rods are generally subjected to bending stress. This bending can create high stresses which cause premature failure of mechanical joints.

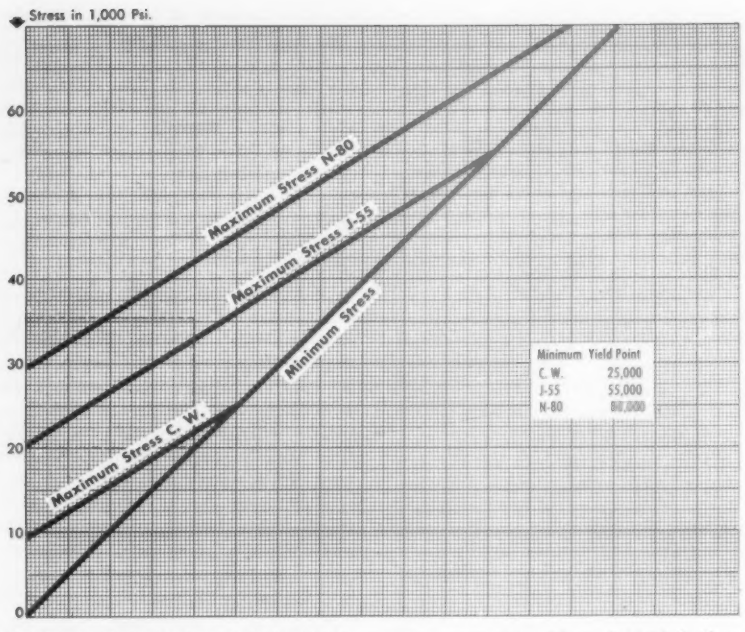
Currently in production are mechanical joints for hollow rods similar to those for conventional rods where the stresses of blending and load are passed through a shoulder rather than through the last fully engaged thread.

**Rod stretch.** The amount of hollow-rod stretch is dependent upon the change in load on the string. This change in load is proportional to plunger size, specific gravity of the fluid, and pump depth. Rod stretch can be expressed by the following formula:

For ¾-in. hollow rods:

$S_r = 0.537\ (D/1{,}000)^2 \times A_p\ S.G.$

For 1 in. hollow rods:




**MODIFIED GOODMAN'S DIAGRAM** for continuous weld J-55 and N-80 hollow sucker rods. This diagram gives a four-to-one safety factor over fatigue endurance limit as determined by rotating beam test. Fig. 5.

$S_r = 0.363\ (D/1{,}000)^2 \times A_p \times S.G.$

where:

$S_r$ = rod stretch, in.
$A_p$ = area of plunger, sq. in.
D = depth of pump, ft.
S.G. = specific gravity of well fluid.

### Overtravel

The amount of overtravel due to acceleration can be calculated from Coberly's[3] formula.

$OT = 1.55\ (D/1{,}000)^2 \times C$ (9)

where:

OT = overtravel, in.
D = depth to pump, ft.
C = acceleration factor.

In analyzing the application of hollow sucker rods to oil-field pumping problems, the following advantages and disadvantages have been noted.

### Advantages

1. Since hollow rods serve both as tubing and rods, they are less expensive than the conventional combination of tubing and solid rods.
2. Inhibitors can be fed into a well.
3. Paraffin, sand and b.s. are all pumped up the inside of the rods, reducing the danger of sticking a pump by material settling on a packer.
4. It is not necessary to strip tubing and rods from a well at the same time if the pump holddown is stuck.
5. Since rod stretch is a function of the area of metal in the rod, hollow sucker rods have less stretch than ½ and ⅝-in. solid rods.
6. Wells equipped with hollow rods would produce more oil under the same conditions due to the differences in rod stretch, Table 1.
7. The maximum polished-rod load is less than with conventional rods when large-diameter plungers are used.
8. The maximum polished-rod load is less than with conventional rods when pumping up the annulus, due to buoyancy.
9. A maximum size of 2-in. insert pump can be used with hollow sucker rods whereas a 1-in. insert pump is the largest that can be used with 1¼-in. tubing, and 1¼-in. insert pump with 1½-in. tubing.
10. The use of hollow sucker rods permits the venting of a lower zone in dual completions.
11. A simple spear type of fishing tool can be used for recovering the rods in case of failure.
12. Rods do not have to be pulled to scrape paraffin.
13. Clearance between the casing and hollow sucker rod coupling allows ample area for venting gas, Table 2.
14. Tubing stretch is entirely eliminated in slim-hole completions and can be eliminated in conventional completions by using a tubing holddown.

### Disadvantages

1. In wells where paraffin is a problem, it may be necessary to scrape the internal walls of the rods more often than with tubing. This condition is partially offset by the fact that the rods do not have to be pulled when scraping is required. Also, a thin application of plastic to internal walls would prevent paraffin accumulation.
2. Mechanical wear of both the hollow rods and casing will be greater than with conventional completions due to the previously mentioned resisting force—and due to a higher coefficient of friction — resulting from less lubrication between the rods and casing. The use of plastic or nylon centralizers should alleviate this.
3. The maximum polished-rod load is higher than that with ½-in. solid rods when using small plungers.
4. The pumping of large volumes of fluid inside the hollow rods is not practical. However, due to the buoyancy, annulus pumping should prove quite feasible and economical.

### Conclusion

Formulas in this article are acknowledged to be approximations of polished-rod maximum and minimum loads. Working fluid level in the annulus, semiflowing wells, paraffin buildup, mechanical friction, and water-cut oils affect the calculations.

Polished-rod load should be measured with a dynamometer. However, it is expected that these formulas will serve as a starting point for better methods. Hollow rods hold promise of becoming more valuable in economical production.

**TABLE 1—CALCULATED PRODUCTIVE CAPACITY OF A 4,000 FT. WELL, WITH 1½-IN. PLUNGER, 44-IN. STROKE, AT 10 S.P.M.**

| | ½-in. Solid rods 1¼-in. tubing | ⅝-in. Solid rods 1½-in. tubing | ¾-in. Hollow rods | 1-in. Hollow rods |
|---|---|---|---|---|
| Rod stretch, in. | 18 | 11 | 9 | 6 |
| Tubing stretch, in. | 5 | 4 | ... | ... |
| Total stretch, in. | 23 | 15 | 9 | 6 |
| Overtravel | 2 | 2 | 2 | 2 |
| Barrels per day at 100% efficiency | 42 | 56 | 67 | 73 |

**TABLE 2—CLEARANCE AREA BETWEEN CASING AND COUPLING, SQ. IN.**

| | ¾ in. Hollow | 1 in. Hollow | 1¼-in. N.U. | 1½ Thinwall |
|---|---|---|---|---|
| 2-in. casing | 1.05 | ... | ... | ... |
| 2½-in. casing | 2.60 | 1.54 | 1.37 | 1.40 |

### Bibliography

1. Factors Influencing Well Loads Combined in New Formula, K. N. Mills, Petroleum Engineer, April 1939.
2. Polish Rod Loads and Their Range of Stress, A. A. Hardy, W. C. Norris Mfgr., Fifth Annual West Texas Oil Lifting Short Course.
3. Estimating Plunger Travel, C. J. Coberly, API Production Bulletin 207, 1931.

| Well | Conventional Pumping | | High Volume Pumping | | Increased Recovery | Increased Income | |
|---|---|---|---|---|---|---|---|
| | Future Rec. Oil-Bbl. ① | Future Life Days ② | Future Rec. Oil-Bbl. ③ | Future Life Days ④ | Bbl. ⑤ | Before Taxes ⑥ | After ad valorem Taxes ⑦ |
| A | 38,600 | 1395 | 328,000 | 2125 | 289,400 | $470,000 | $441,000 |
| B | 13,000 | 876 | 160,000 | 1960 | 147,000 | 183,000 | 168,000 |
| C | 7,000 | 683 | 223,000 | 3438 | 216,000 | 289,000 | 267,000 |
| D | 23,000 | 1113 | 336,000 | 2592 | 313,000 | 449,000 | 418,000 |

**ECONOMIC ADVANTAGES** of high-volume pumping over conventional pumping for four wells studied. Table 1.

On a nonprorated lease . . .

# 4. High-volume pumping can up profits

• Here are some cases where high-volume pumping will apply, and improve the financial outlook of your leases. Operating costs of a submersible electrical centrifugal pump are considered in determining the payout with this method.

BY R. W. PARKER
Ohio Oil Co., Cody, Wyo.

WHAT is high-volume pumping?

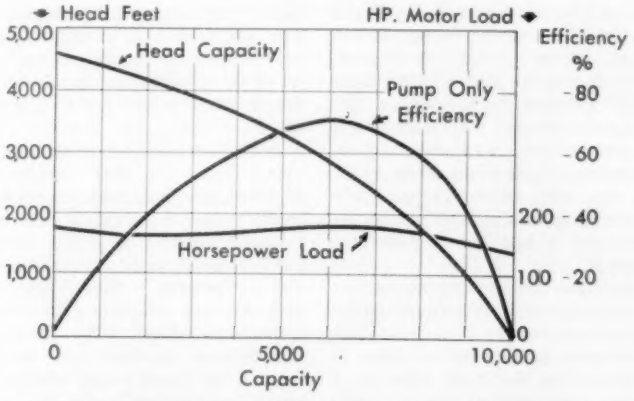
Where can it be applied to advantage?

For purposes of this article, high-volume pumping is the lifting of fluid from a well at a rate in excess of 3,000 bbl. per day. The pumping unit is a submersible, electric, centrifugal pump. This does not imply that other pumps will not suit these conditions, but this is the type with which we have had the most experience, and the type chosen for the economic analyses.

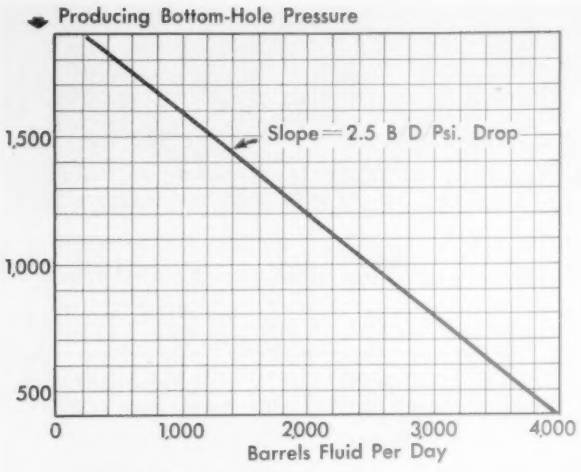
**Pump characteristics.** Located at the bottom of the pump assembly is a three-phase squirrel-cage induction-type electric motor that operates at approximately 3,600 r.p.m. A protector above the motor is used to prevent well fluids from entering the motor section. The pump is a multistage centrifugal-type unit, operating at the same speed as the motor. Three-wire conductors, insulated against well fluid and protected by steel armor, supply the current for pump operation. It is strapped to the tubing at 15 to 20-ft. intervals as the assembly is lowered into the hole.

Motors for larger pumps require uncommon voltages from 700 to 1,000 volts. If commercial power is used,

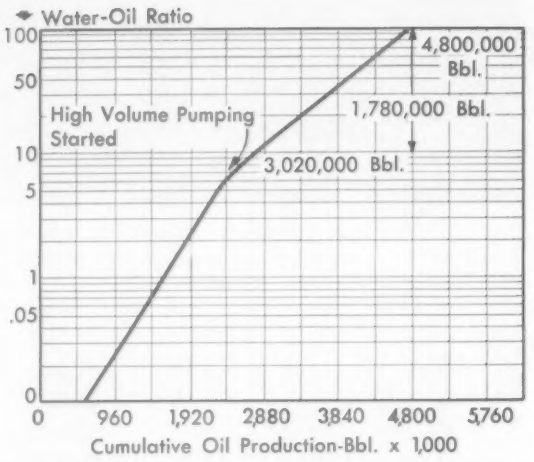
Presented at the spring meeting of the Rocky Mountain District Division of Production, API, Casper, Wyo.




**TYPICAL PERFORMANCE CURVES** for a submersible pump. This test was conducted with a 100-stage pump on a water test in 6⅝-in. o.d. casing. Fig. 1.




**TYPICAL** productivity index curve. Fig. 2.




**PERFORMANCE** of an active water-drive reservoir at a pressure above bubble point. Fig. 3.

special transformers are required. Some power companies are furnishing transformers as part of their usual service without additional charge, while others require the operator to furnish the transformer. If generators are used, they may be obtained to provide the proper voltage without transformers.

Pumps of the type used in our work can be run in conventional-sized casing, and any part, or all of the equipment, including the generator can be rented for testing purposes. It has become standard procedure for Ohio Oil Co. to rent equipment for a 30-day test period. If the well will support a high-volume pump, then the equipment is purchased.

Typical performance curves for the submersible pump are shown in Fig. 1. The efficiency ranges as high as 72%, but proper design is important, as the curve drops off rapidly on either side of this peak.

### Selection of Equipment

It must be determined if a well will support a high-volume pump, and if so what volume of fluid is desired. Some wells require stimulation before they will produce high volumes, and wells in this category may tend to lose their productivity with time. Care should be exercised when selecting the pump for wells of this type. Wells that have a naturally high productivity are best suited for high-volume withdrawal.

There have been instances where such wells actually experienced an increase in productivity after producing high volumes for a period of time. It is believed that the high velocity of fluid may enlarge the flow channels by erosion.

The most important parameter required for proper pump design is the well's fluid-productivity index. This can be secured by producing the well at different rates with conventional pumping equipment. The accuracy of such data is dependent upon the care used in pressure and rate observations and the conditioning of withdrawal rates for sufficient time prior to making such tests.

For finite reservoirs, the various rates can be plotted against pressure drawdown on either coordinate or log-log paper and should result in a straight-line relationship. A typical productivity-index curve is shown in Fig. 2. It is then a simple matter to extrapolate this line to the higher possible producing rate for which the pump will be designed.

Unfortunately, however, the extrapolated portion of the line in the higher rate ranges may not conform with actual sustained well performance. This is undoubtedly the result of transient pressure effects within the drainage radius of the well which were ignored when securing the original data. For this reason it should be remembered that the initial design based on data observed in the low-volume ranges may or may not be the proper design.

A frequent change in design is necessary after the first installation of high-volume pumping equipment is made. The equipment can be exchanged for that of proper design by paying the difference in the price of the equipment, if any, plus repairs and the cost of pulling and running other equipment. After determining the volume desired and the head against which the pump will produce, performance curves for the various pumps similar to the one in Fig. 1 are referred to for pump selection. The curve having the highest efficiency for the volume and head desired is the proper selection.

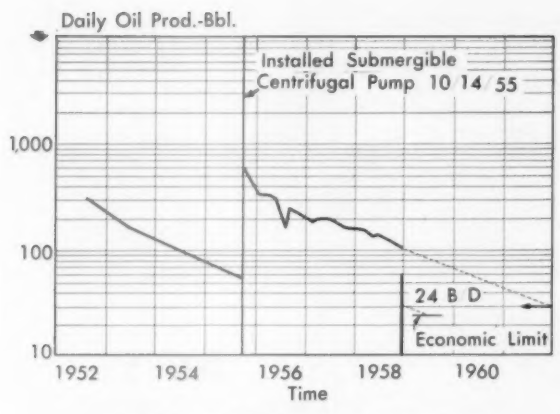
### Application

High-volume pumping may be desirable for several reasons, but basically they all revert to one of economics. Some of the more obvious applications are as follows:

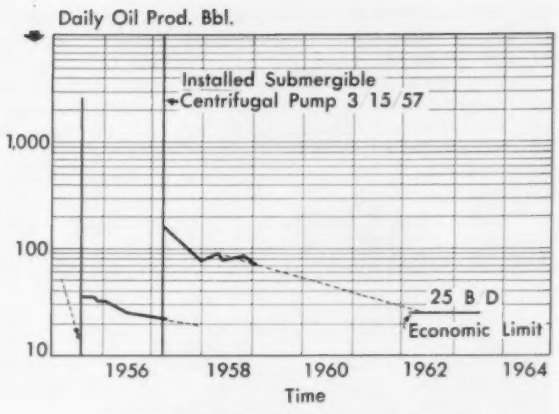
● **When it becomes uneconomical to produce a well with conventional equipment** because of high water-oil ratio, it may be economical to install a high-volume pump. This application is usually, but not always, confined to wells where it is impossible or impractical to shut off water without sacrificing productivity. It is quite common for the water-oil ratio to decrease when higher volumes are withdrawn.

Suppose, for example, that a producing formation contains thin, highly permeable zones connected to a high-pressure aquifer. The oil in these zones will be depleted long before the entire formation is depleted. If these highly permeable zones become water productive and support a high fluid level, it may be feasible to resort to high-volume withdrawal to reduce the fluid head against the oil-bearing zones of the formation. The net result may be an increase in oil production at a lower water-oil ratio.

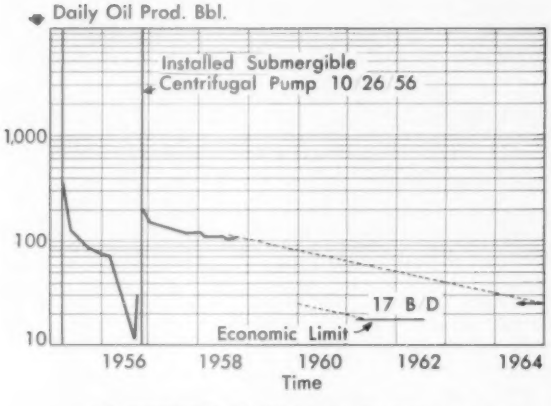
● **It has become common practice in the Rocky Mountains** to pump high volumes from highly fractured reservoirs where pressures are maintained by active water drives. Matrix porosity filled with oil is usually present to some extent in these fractured reservoirs. Recovery from a reservoir of this nature is usually quite low because the oil trapped in the matrix porosity is retained there by high flowing pres-



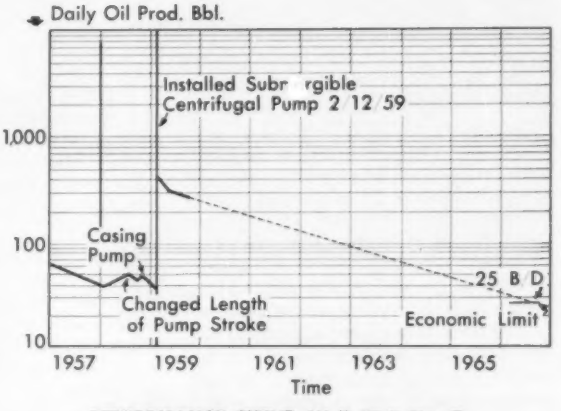

**PERFORMANCE CURVE**, Well "A." Fig. 4.




**PERFORMANCE CURVE**, Well "B." Fig. 5.




**PERFORMANCE CURVE**, Well "C." Fig. 6.




**PERFORMANCE CURVE**, Well "D." Fig. 7.

sures in the fracture system. The oil in the fracture system will be produced early in the productive life of the well, and then the fractures will become filled with water from the aquifer to contribute to a high water-oil ratio at the well bore.

The problem then becomes one of recovering the oil remaining in the matrix porosity. It is usually impossible to shut off water in a highly fractured reservoir without also shutting off the oil production. The most practical solution found to date is that of lifting high volumes of water from the fracture system to lower the flowing pressure in the fractures so that the oil trapped in the matrix system can migrate to the fracture system.

It may be propelled by solution gas or fluid expansion or both. This application is obviously one of increasing ultimate recovery, as in secondary-recovery operations, but using a reverse technique. It can be accomplished only by increasing the pressure differential across the matrix rock.

● **Competitive offsets** may sometimes force an operator to resort to high-volume pumping. Suppose, for example, that one operator has several wells completed on the lease line removed from the gas-oil and water-oil contacts, and that because of the structural position another operator cannot afford to drill additional wells on his lease to compete with the offsets. He may then resort to pumping as much oil as possible from fewer wells with high-volume pumps.

● **Some homogeneous sandstone reservoirs** under an active water drive and somewhat above bubble-point pressure have responded favorably to high-volume pumping. Fig. 3 is an example of such a zone. Again the volume pumped must exceed the influx to create a pressure reduction in the reservoir.

● **High-volume pumping may increase over-all profit** by more rapid depletion of the reservoir, provided that the rate at which the reservoir is produced will not materially affect ultimate recovery. The investment of high-volume pumping is justified if the value of discounted income can be increased to an amount greater than the additional investment for the high-volume pumping equipment. An operator faced with fluctuating market conditions, but not restricted by statutory proration, may find high-volume pumping a solution to his economic distress by being able to produce more oil when markets are favorable.

### Field Performance

Ohio Oil Co. has kept accurate records of test data, investment, and operating expenses for many wells having high-volume pumps in the Casper division. The purpose of keeping detailed records is to minimize capital investment by anticipating the well's economic limit so that the pumping equipment can be transferred to another location. Investment for high-volume pumping equipment is about twice that required for conventional pumping equipment, and the operating cost is considerably higher over-all but not necessarily higher when considered on a per barrel lifted basis.

Performance curves of four wells chosen at random are shown in Figs. 4, 5, 6, and 7. Since the installation of such facilities usually occurs when conditions are in a highly depleted state, a constant percentage decline is applicable to producing rates. Note that the economic limit varies with

the individual well as it is directly related to investment, operating expense, price of crude, etc.

For example, well A in Fig. 4 has an economic limit of 24 bbl. of oil per day after ad valorem taxes, at which time the water-oil ratio will be about 99.3 to 1. The economic limit for this well, equipped to produce 3,300 bbl. of fluid per day against a total head of 3,200 ft., is determined in the following manner:

| Nature of charge— | Operating cost per day |
|---|---|
| Overhead | $2.37 |
| Electric power | 28.47 |
| Lifting expense | 3.83 |
| Depreciation: | |
| Motor (2-year life) | 5.83 |
| Pump (4-year life) | 1.20 |
| Conductor (10-year life) | 1.47 |
| Miscellaneous (20-year life) | 0.70 |
| Total operating cost per day | $43.87 |

Net price of crude after royalty is $1.89 per barrel. Economic limit before taxes is 43.87/1.89 or 23 bbl. of oil per day. Assuming that ad valorem taxes will remain as presently imposed at approximately $0.10 per barrel, the economic limit becomes 24 bbl. per day after these taxes. The initial investment for high-volume pumping equipment for well A was about $16,000, which is at least twice that required for conventional equipment for this well. This investment includes the cost of a special transformer. The well received electric power from a public service company.

Table 1 shows economic advantages of high-volume pumping over conventional pumping for the four wells previously mentioned. Column 1 is the volume of oil that would have been produced with conventional equipment from the time high-volume equipment was installed to the economic limit of 10 bbl. of oil per day. Column 2 shows the number of days required to produce the oil in column 1. The barrels of oil that will be recovered by high-volume pumping are shown in column 3, and the number of days during which this oil will be produced is shown in column 4.

Increased ultimate recovery resulting from high-volume pumping appears in column 5. Additional income before and after ad valorem taxes is shown in columns 6 and 7, respectively. These figures do not reflect true total profit because income has not been discounted and federal income tax has not been considered.

**Making evaluation.** Here's how these economic evaluations were made. First, it must be remembered that a constant percentage decline was assumed for all producing rates as indicated by the rate-time plots. Rather than attempt to plot rate-cumulative curves to find ultimate recoveries, the familiar Arps equations, $E^{dt} = q_i/q_f$ and $Q = (q_i - q_f)/d$, valid for constant percentage-decline work were used to calculate the decline rate, d, and the cumulative recovery, Q, at time t.

Again, referring to well A in Fig. 3, it can be seen that the economic limit of 10 bbl. of oil per day had not been reached with conventional equipment when high-volume equipment was installed. The last year — September 1954, when $q_i = 87$, to September 1955, when $q_f = 57$—was used to calculate the decline rate at the lower pumping rates; that is, $E^{dt} = q_i/q_f = 87/57 = 1.56$, wherein t = 1 year, d = 44.5%.

Future cumulative recovery that could be expected with the conventional pump at the time the high-volume pump was installed was calculated as follows: $Q = (q_i - q_f)/d = 365\ (57 - 10)/0.445 = 38{,}600$ bbl. to an economic limit of 10 bbl. of oil per day. Applying the same equations to the high-volume portion of the curve, d was found to be 40.6% and 289,400 bbl., the increased ultimate recovery.

Income for the increased ultimate recovery is then determined for well A in the following manner: From Table 1 and previous calculations, it is known that this well will produce 2,125 days at an operation cost of $43.87 per day or a total of $93,223 for the life of the well while pumping high volumes. Total income will be 289,000 × $1.89 = $563,220, and $1.89 is gross price of the crude less royalty. The difference then $563,220 − $93,223 is the total additional income before ad valorem taxes, or $469,997. Deducting $0.10 per barrel for this tax on 289,400 bbl. leaves an income after this tax amounting to $441,057.

**Don't miss—**

**"Four Current Developments in Oil-Well Pumping"**

**page 107**

### Conclusions

High-volume pumping can be profitable if care is exercised in its application. It requires extensive well testing and sound engineering analysis of reservoir conditions and economic considerations. Inasmuch as it is a deviation from standard operating procedure and because it is a means of increasing ultimate recovery, high-volume pumping can justly be considered a form of secondary recovery.

## BOOKS

GEOLOGY. Fifth Edition. By Emmons, Allison, Stauffer, and Thiel. Published by McGraw-Hill Book Co., Inc., New York. Price $7.95. 491 pp.

This new volume, subtitled "Principles and Processes," is the fifth revision of the original volume, and is confined to physical geology. It is designed for the student planning to major in earth sciences.

Many new chapters have been included, and type has been completely reset in two-column format for ease of reading. This edition includes some of the results of the investigations made during the International Geophysical Year. Another new feature is a glossary of geologic terms.

Various chapter headings include "The Earth as a Planet," "Atoms, Radioactivity, and Geologic Time," "Vulcanism," "Snow, Ice, and Glaciers," "Sea Movements and Their Effects," "Earthquakes and the Interior of the Earth,"—these are just a few of the many physical phenomena that are covered.

The volume is profusely illustrated with photographs and line drawings, and should be a valuable addition to the library of any geologist, student or practitioner.

X-RAY ABSORPTION AND EMISSION IN ANALYTICAL CHEMISTRY. By H. A. Liebhafsky, H. G. Pfeiffer, E. H. Winslow, and P. D. Zemany. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York City 16. 357 pp. $13.50.

This book has been written specifically for the analytical chemist who wants to understand and use the modern methods of X-ray spectrochemical analysis, employing X-ray absorption or X-ray emission. The authors describe the history and underlying theory, the reliability of X-ray emission methods, a variety of applications, and all the necessary equipment and techniques.

The beginning is a review of the general properties of X-rays, and this is followed by separate chapters on absorptiometry, film thickness determination, X-ray emission spectrography, and special topics.

The rapidly growing subject of X-ray emission spectrography receives emphasis, since it has become a powerful tool for qualitative and quantitative analysis. This position has been strengthened by the considerable increase in importance of such materials as the rare-earth elements, the platinum metals, tantalum, tungsten, and uranium. X-ray emission can be readily applied for the analysis of these elements, as well as many of the lighter ones (e.g., aluminum and silicon), and for the determination of traces.

Note: The Oil and Gas Journal maintains a book department. Write to the READER SERVICE DEPARTMENT, P. O. Box 1260, Tulsa 1, for copies of the book list. Often books reviewed here may be purchased from this source.

**NEW ADDITIVE** and special retarders made possible a new world's record for squeeze cementing on this well. On the job, Gulf Oil Corp. successfully shut off in a single stage a 230-ft. perforated interval. Well is in Wasson field near Denver City, Tex.

# New cement additive cuts water loss

## *... without the usual side effects*

**BY ED McGHEE**
Drilling Editor

OIL-WELL CEMENTS can now, for the first time, have a low water loss without harmful side effects caused by conventional water-loss reducers.

The thing that makes this possible is a new organic chemical. Small quantities of the material (1.0 to 1.5%) in a cement slurry can cut water loss below 50 cc. per 30 minutes. This same quantity of the material has little effect on the slurry's viscosity or set strength. In low-temperature cements (API Class A), the material has no effect on thickening time of the slurry; in higher-temperature cements (API Class E), the new chemical does retard thickening time somewhat but not nearly so much as older water-loss reducers.

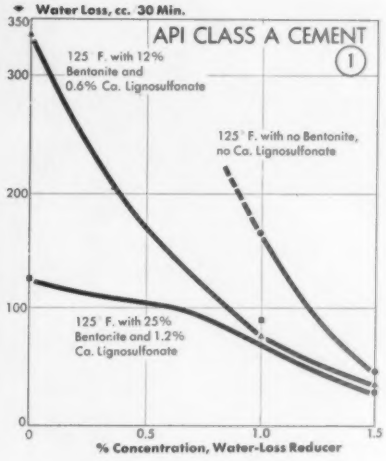
The material, a high-molecular-weight synthetic polymer, has been used in more than 25 field wells. Most of these jobs were squeezing perforations, an operation which most agree is best done by low-water-loss slurries. Remainder of the jobs were in cementing long strings of casing in areas where high-water-loss slurries had failed to get proper fillup behind the pipe. Results in both types of jobs have been quite successful, according to the product's manufacturer.

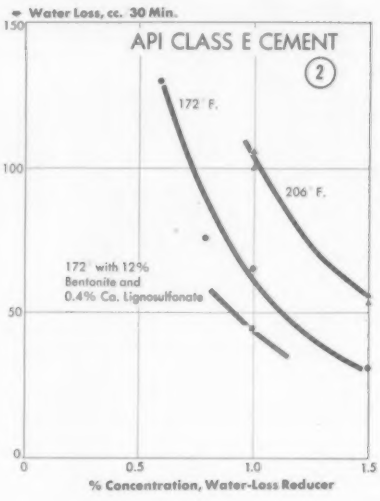
The polymer was developed by Dowell Division of Dow Chemical Co. and will soon be available throughout the oil country under the trade name "Flac." It is a dry powder which can be easily handled like other cement additives; it is water-soluble and has good thermal stability. The company reports that its material is also resistant to hydrolysis in high-pH portland cements.

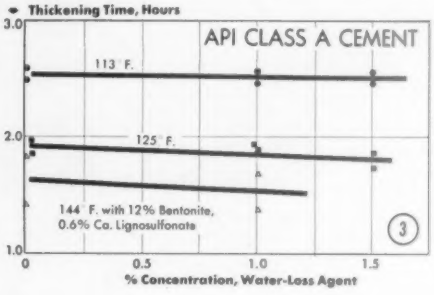
**Why low water loss?** It's difficult to measure the water loss of ordinary, neat cement. But it is usually put between 600 and 2,500 cc. per 30 minutes. In an actual field-cementing job, pressure inside the well rapidly forces water out of the slurry and into the pores of exposed formations.

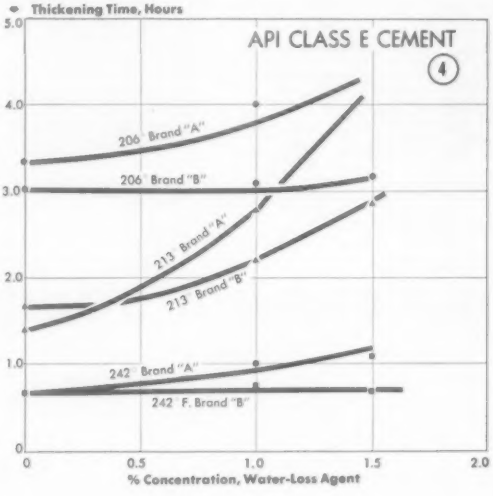
It isn't this lost water that is important. What is important are the cement solids left behind when the water is gone. The solids pile up before the formation face (in cementing casing) or around perforations (in squeezing). In some cases, the buildup of solids can be enough to bridge the hole. Result in a casing-cementing job can be extra-high circulating pressure and, perhaps, loss of circulation and poor cement fillup behind the pipe. In a squeeeze operation, the solids buildup can prevent cement from reaching many of the perforations. As a result, several squeeze jobs may be necessary before the interval tests dry.

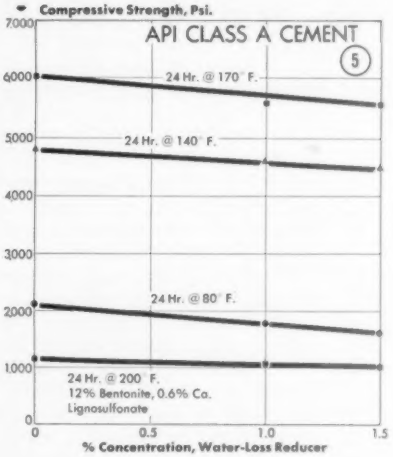
Neat cements aren't the only ones with this problem. Although slurries containing bentonite are better, their water loss is often high enough to cause trouble.

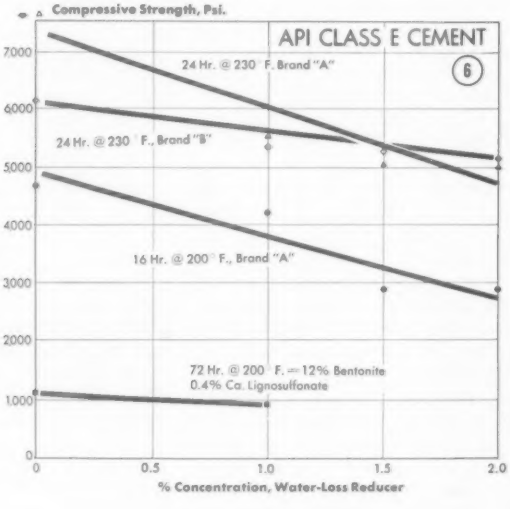



**NEW SYNTHETIC POLYMER** not only cuts water loss of both low and high-temperature cements (Figs. 1 and 2), but it also does so without causing the extreme retarding of thickening time (Figs. 3 and 4) caused by older additives. The material has little effect on set strength of low-temperature cements (Fig. 5) and hardly more on high-temperature slurries (Fig. 6).

Many of the materials previously used to cut water loss do their work by increasing the viscosity of the water phase of the slurry. Such materials generally retard the thickening and setting time of the cement; this trait makes the materials troublesome because laboratory tests must be run to fix exact effect on each batch of cement. Then, other additives must often be used to offset the bad effects. In addition, these materials make the slurries harder to pump and, often, cut the strength of the set cement.

**How it performs.** Figs. 1 and 2 show that the new material, Flac, does reduce the water loss of both API Class A (for use to 6,000-ft. depth) and API Class E (for use from 6,000 to 14,000 ft.) cements. Class A slurries were tested at 125° F., the Class E's as 172° and 206°. A concentration of 1.5% of the material will usually keep water loss of a slurry below 100 cc. per 30 minutes as long as temperature is below 240° F. A concentration of 1.0% keeps loss below 100 cc. at temperatures below 200° F.

Fig. 3 shows thickening time of API Class A cements is unaffected by normal additions of the polymer water-loss reducer. While the material does retard Class E cements, as Fig. 4 shows, the extent of this retarding is well within practical limits for field handling.

Dowell finds that the compound has little or no retarding action when large quantities of bentonite are used in the Class E cements. When much bentonite is used, calcium lignosulfonate is recommended to retard thickening time enough for the job at hand. The water-loss agent does not affect the retarding efficiency of the calcium lignosulfonate.

Effect of the material is hardly noticeable on compressive strength of Class A cements (see Fig. 5); effect on Class E cements is minor to moderate, as Fig. 6 shows.

It appears that about 1.5% of the water-loss agent will be the maximum required in most cases. This quantity brings the water loss near to minimum and more than 2% can cause undesirable increases in viscosity of the slurry.

**Field trials.** Most of the early field work with Flac was in squeeze jobs on perforations in cased holes. Usually, enough tail pipe was run below the squeeze packer that excess cement could be circulated out of the hole without lowering the packer into the perforations. Several of the cemented sections are below 14,500 ft.; bottomhole temperatures were as high as 310° F. Often, the "hesitation" squeeze technique was used.

Dowell states that more of these squeezes were successful than could be expected with conventional cements. Even long perforated sections (up to 100 ft.) have been successfully squeezed off in a single job.

The casing-cementing jobs have been done in routine fashion, with cement fillup behind the pipe apparently quite good, the company says.

Testimony to the effectiveness of the low-fluid-loss cement in squeeze operations is Gulf Oil Corp.'s 7 Ory in Wasson field, near Denver City, Tex. In this well Gulf used a special cement blend containing the new fluid-loss reducer and special retarders. With this slurry, the company successfully squeezed off a 230-ft. interval containing 11 separate sets of perforations. This is one of the longest squeeze operations ever performed anywhere.

The Gulf technique called for holding the cement on the perforations for a period of more than 4 hours. Then the retarded mixture was circulated from the well. There was no set cement and no "buttons" of cement left in front of perforations which would require drilling out later. Result was an effective and inexpensive squeeze job.

**Bibliography**


1. "Oilwell Cementing Practices in The United States": API, 1959.
2. Stout and Wahl, "A New Organic Fluid-Loss Control Additive for Oil Well Cements": presented at Upper Gulf Coast Drilling and Production Conference, SPE, Beaumont, Tex., March 1960.


# Nelson Refinery Cost Index

Published in the first issue each month in the Engineering Section.

Compiled by W. L. Nelson, Technical Editor and petroleum refinery consultant, Tulsa.

Charts of the indexes are published each year in a late January or early February issue.

Indexes of selected individual items of equipment and materials are also published on the Costimating page in the first issue of the months of January, April, July, and October.

## Refinery Construction Cost Index (1946 Basis)

Explained on page 101 of the issue of August 5, 1957.

| | 1950 | 1954 | 1957 | 1958 | 1959 | March 1960 |
|---|---|---|---|---|---|---|
| Pumps, compressors, etc. | 138.2 | 166.5 | 206.7 | 214.7 | 226.5 | 228.1 |
| Electrical machinery | 134.9 | 160.0 | 188.9 | 192.7 | 195.8 | 197.4 |
| Internal-combustion engines | 126.0 | 150.5 | 173.9 | 178.3 | 178.5 | 178.5 |
| Instruments | 127.8 | 154.6 | 187.4 | 194.9 | 201.0 | 198.6 |
| Heat exchangers | 140.0 | 171.7 | 203.6 | 181.2 | 178.9 | 195.7 |
| Misc. equipment average | *126.2 | 160.7 | 192.1 | 192.4 | 196.1 | 199.5 |
| Materials component | 149.5 | 174.6 | 201.9 | 204.2 | 207.8 | 207.8 |
| Labor component | 144.0 | 183.3 | 208.6 | 220.4 | 231.6 | 237.6 |
| Nelson construction index | 146.2 | 179.8 | 205.9 | 213.9 | 222.1 | 225.7 |

*Used in computing the Nelson Index until April 1952.

## Refinery Operating Cost Indexes (1956 Basis)

Explained on page 171 of the issue of June 1, 1959.

| | 1946 | 1952 | 1954 | 1958 | 1959 | Feb. 1960 |
|---|---|---|---|---|---|---|
| Fuel cost | 49.6 | 81.0 | 86.5 | 102.1 | 103.5 | 105.8 |
| Labor cost | 73.1 | 88.7 | 90.9 | 105.0 | 102.3 | 99.8 |
| Wages | 52.4 | 81.5 | 88.7 | 105.4 | 111.5 | 111.3 |
| Productivity | 68.3 | 90.2 | 97.1 | 100.3 | 109.0 | 111.6 |
| Investment, maintenance, etc. | 51.2 | 83.6 | 92.0 | 109.5 | 113.7 | 115.7 |
| Chemicals cost | 37.0 | 72.1 | 85.7 | 104.4 | 107.8 | 113.0 |
| Operating cost indexes: | | | | | | |
| Refinery | 58.5 | 80.5 | 88.7 | 105.8 | 106.8 | 107.4 |
| Process units† | 62.9 | 82.2 | 88.4 | 105.8 | 106.0 | 105.8 |

†Add separate index for chemicals, if any are used.

- Structural failures.
- Mechanical-Equipment failures.
- Thermal-performance deficiencies.
- Fungal attack on redwood.

# These four problems guide cooling-tower design

TODAY'S cooling-tower designers are using these four problems as the criteria for their latest designs.

At one time, cooling towers were a rarity in almost all parts of the country. A larger tower was one that would circulate perhaps 5,000 g.p.m. When the process, power, and refining industry mushroomed, cooling-tower manufacturers had to change their thinking almost overnight.

Adapted from a paper presented to a process section of ASME, Houston.

BY ROY W. MAZE
Gulf Coast Regional Manager,
Marley Co.

Instead of 5,000 gal. with two or three fans, they were challenged to supply towers that would cool 50,000-75,000 g.p.m., which meant that towers with 20 to 40 fans were not uncommon. In addition new processes required colder water, which further increased the size of towers.

Here are some of the problems this rapid growth presented and how today's designers are solving them.

### Structural Problems

Over the years as towers grew larger and mechanical equipment became heavier, it was found that structural columns could bow and cause the framework to sag and fail. The main cause was twofold.

First of all, some manufacturers had used 4 by 4-in. structural columns on as great as 9-ft. centers, transversely and longitudinally. Today's practice is to have 4 by 4-ft. structural columns on 6 by 6-ft. centers or 4 by 8-ft. centers.

The second problem was either a shortage of internal girts, or internal girts that were nailed rather than bolted to the 4 by 4-in. framework. Some designers considered longitudinal and transverse girts necessary only to support the fill.

Manufacturers now normally run double girts both transversely and longitudinally at 6-ft. elevations and have them bolted to the 4 by 4-in. structural framework. Unless there is considerable fungal attack, 4 by 4-in. redwood columns stiffened in this manner make a satisfactory and rigid framework for the cooling tower.

Carbon-steel bolts used to be a problem, but they have been replaced by either hot-dip galvanized steel, bronze, or stainless-steel bolts.

Eliminator spacers have been vastly improved. While the basic eliminator blade remains about the same, the method of holding that blade in position has improved. Early eliminator spacers were made from dadoed redwood members and tended to break off readily. Manufacturers turned to pressed wood and other materials which were somewhat better but still did not have a satisfactory life. The trend today is to pressure-treated plywood that is demonstrating excellent service qualities.

Today, towers are designed strong enough to support manifold header pipes which used to be buried alongside the tower. These pipes, running up to 54 in. in diameter, carry a tre-

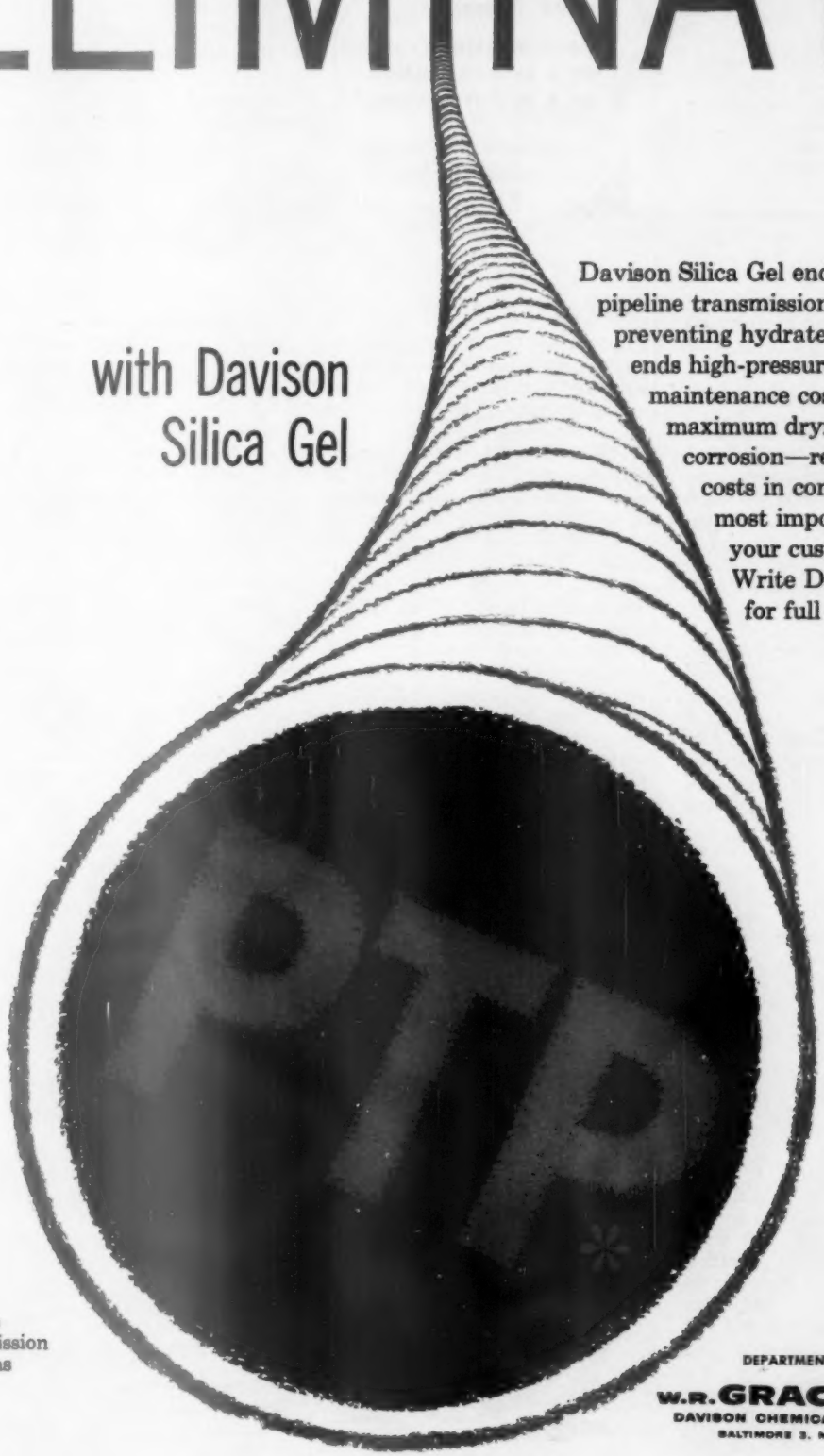
## About buying cooling towers . . .

Just what does the average cooling-tower purchaser want today when he buys a cooling tower? Companies who have operated cooling towers for years are considering the following general features and data when writing detailed cooling-tower specifications:

1. Pressure-treated wood for longer life.
2. Cement asbestos board casing and louvers for more pleasing exterior appearance.
3. Taller fan cylinders to cut down on recirculation.
4. Multibladed fans to prevent air pulsation.
5. Gear boxes with a minimum 1.5 service factor for longer life.
6. Gear boxes with oil-level sight gage, fill and drain connections outside the fan cylinder.
7. Gear boxes with sidestream oil filters.
8. Stainless-steel drive shafts to resist corrosion.
9. Mechanical equipment mounted on heavy steel weldments.
10. Portable mechanical handling kits so mechanical components may be removed from inside the fan cylinder.
11. Derricks at the end of the tower for hoisting barrels of oil or mechanical equipment.
12. Vibration cutout switches on mechanical equipment.
13. Water-flow control valves on each fan cell.
14. Complete partitions in each fan cell to prevent air bypassing.
15. Accessibility to all parts of the cooling tower.
16. TEFC or explosionproof electric motors, depending upon atmosphere.
17. Bronze bolts.
18. Evaluation of horsepower on fans and pumps over a 10-year period.
19. Purchase towers on an ambient wet-bulb basis, rather than an inlet or average wet-bulb reading.
20. Request bidders to supply c.f.m., static loss through tower, fan efficiency, fan horsepower, fill spacing, fill volume, etc., so all bids can be analyzed.
21. After tower is in operation, run a joint thermal-performance test with the manufacturer per the latest ASME cooling-tower test code.

# ELIMINATE

with Davison Silica Gel



Davison Silica Gel ends natural gas pipeline transmission problems. By preventing hydrate formation, it ends high-pressure losses—lowers maintenance costs. By providing maximum dryness, it decreases corrosion—reduces power costs in compression—and, most important, keeps your customers happy. Write Dept. 3108 today for full information.

* Pipeline Transmission Problems

DEPARTMENT 3108

W.R. GRACE & CO.
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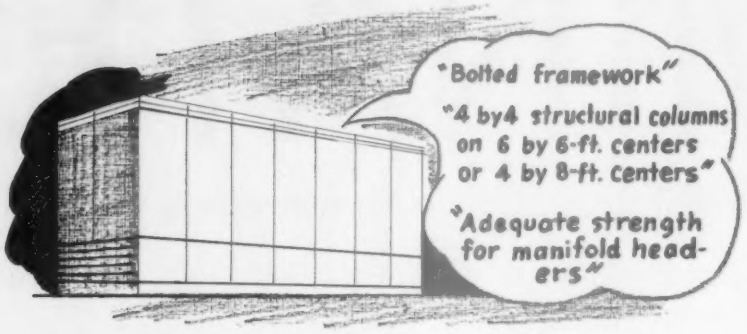
## What designers consider in structural problems:


"Bolted framework"
"4 by4 structural columns on 6 by 6-ft. centers or 4 by 8-ft. centers"
"Adequate strength for manifold headers"

mendous weight of water, but designers have anticipated this in structural loads. Many users now ask for a stress analysis on any tower that they buy.

### Mechanical Equipment

Today, most fan blades are made of aluminum, stainless steel, monel, or plastic. They are very common up to 22 ft. in diameter. Fan designers have had a chance to take advantage of the best materials available and to test each step of their development thoroughly. Failures on today's cooling-tower fans are rare.

**Air pulsation.** One of the problems remaining is that of "air pulsation" on larger-diameter fans. All fans are carefully balanced at the factory. However, since cooling-tower fans operate inside of a symmetrical wood structure, blades tend to "load and unload" as they pass over structural supports.

As air pulsates against the side of the fan cylinder, it tends to loosen up and the pulsation is carried throughout the structure. Bolt holes are worn larger, and in a period of time the whole structure vibrates.

Many users have solved this problem by replacing three or four-bladed fans with multibladed ones. While the three and four-bladed fans run satisfactorily in 16-ft. and smaller diameters, fans of 18, 20, and 22-ft. diameters operate with excessive air pulsation unless the number of blades is increased.

Fans are available with 6, 8, 9, and 12 blades. In an effort to whip air pulsation, fan cylinders have been braced, wrapped with angle iron, and made oversized to give greater tip clearance, which prevents pulsation. A greater tip clearance in fan cylinders makes the fan inefficient and, while it will not pulsate, it will not operate at full capacity.

Today, 22-ft.-diameter multibladed fans powered by 100-hp. motors are run in 14-ft.-high fan cylinders with close tip clearances and no pulsation. Many users who operate towers in corrosive areas have found it judicious to use stainless-steel hardware in fan assemblies, so that fan blades may be easily repitched or removed as the occasion demands.

... **Gear boxes** have been remarkably improved in the past 15 to 20 years. Recent developments include extended drain-and-fill oil lines and moving the oil-level sight gage outside the fan cylinder. It is now common to drain out old oil or to add new oil without going inside the fan cylinder to get to the gearbox.

Recently one manufacturer has added an integral sidestream filter to remove any foreign particles in the oil stream. Gear boxes are now available from several manufacturers in sizes up through 125 hp., and are giving years of faithful service with a minimum of maintenance.

**Drive shafts.** Cooling-tower users today insist on a nonlubricated-type driveshaft assembly. The minimum drive-shaft material is hot-dip galvanized steel, and in highly corrosive areas the standard is rapidly becoming stainless steel on at least the tube-and-flange assembly.

Costly failures have resulted when drive shafts break or twist apart because of corrosion. More often than not the loose end swings up into the fan and causes fan and cylinder damage.

Manufacturers are going to stronger drive-shaft guards and locating them so that this cannot happen.

**Equipment supports.** Today's mechanical-equipment-support standard is a structural-steel integral part that continues through the fan cylinder. This makes it easier to remove mechanical equipment from inside the cylinder. While many users want and expect hot-dip galvanized steel, in unusually corrosive conditions they add another protective coating on top of the galvanized finish.

Several cooling towers are operating on the Gulf Coast with unitized supports made from structural aluminum. After 5 years of operation, they are holding up quite well.

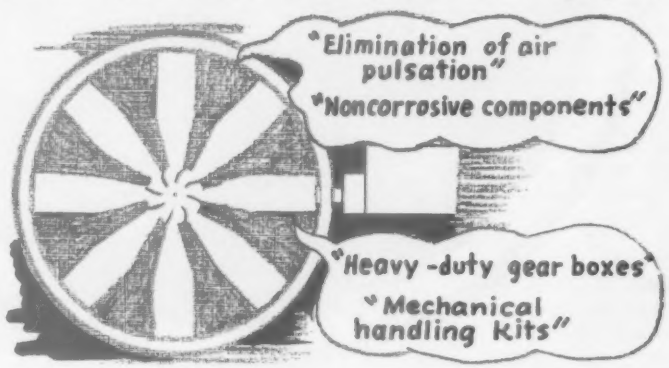
Many users are specifying removable access doors in fan cylinders, with the bottom opening at the fan deck. The door should be large enough to remove any mechanical equipment by means of skids or rollers if the occasion arises.

Some manufacturers furnish "mechanical handling kits" consisting of a portable tripod, rubber-tired dolly, and aluminum track. Maintenance personnel can then bolt the portable tripod to the unitized steel, lay the aluminum track on the same steel, roll out the dolly, lift the gearbox assembly on the dolly, and roll it to the end of the tower.

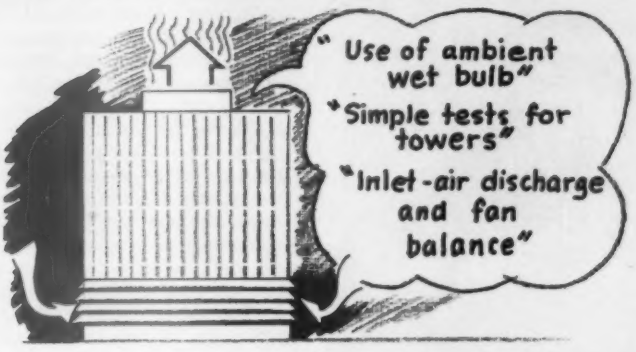
Here a permanent davit or derrick on the tower can be used to lower equipment to a truck at ground level. This same derrick is useful in hoisting barrels of lubricating oil to the cooling-tower fan deck.

It has long been recognized that the shape of the fan cylinder contributes to fan efficiency. It is not uncommon now to see velocity-recovery-type fan

## What designers consider in mechanical equipment:



**What designers consider in thermal performance:**




cylinders 14 to 20 ft. high on top of new cooling towers. Their functional shape helps to recover exit velocities, which help move more air with the same horsepower, or the same quantity of air with less horsepower.

In addition, high stacks discharge the air at a higher elevation and allow fresh air to blow between the fan stacks. Wind blowing between the fan cylinders helps to dilute the saturated air and cuts down recirculation.

### Thermal Performance

Early cooling towers were usually natural-draft towers, and it was almost impossible to come up with accurate air-water heat-transfer data. Since the tower was usually sold as part of a complete process plant, as long as the process worked it was assumed that the cooling tower was performing according to the theoretical calculations.

Later, manufacturers began to set up cooling-tower test sites. Usually a small area next to a plant with a good source of steam was secured and a cooling-tower test cell was developed.

Usually these cells consisted of a structure 6 by 6-ft. in plan area, ranging from 20 to 40 ft. high, with solid walls having air-inlet louvers at the bottom. They were designed so that different types and various amounts of filling could be tested along with different types and alternate designs of water-distribution systems. A fan induced air through the test cell and air quantities could be measured accurately for the first time.

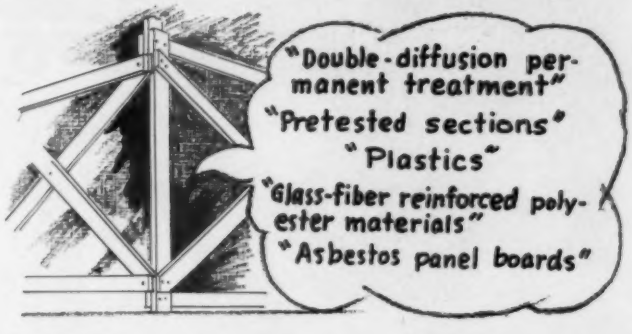
From this test data some correlations were developed. It was not too difficult to translate the data taken from a 6 by 6-ft. test cell and determine what a cooling tower would do if it were 18 by 18 ft.

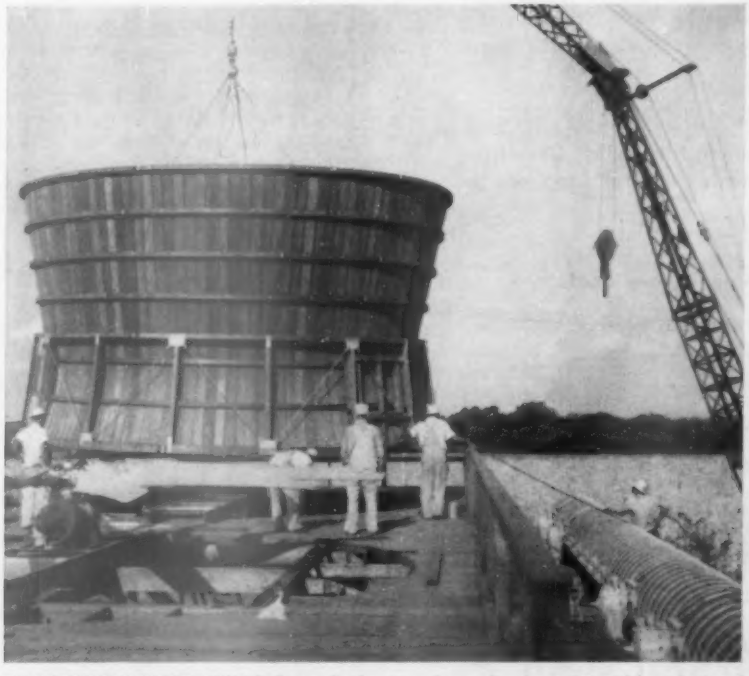
However, as the 18 by 18-ft. cells became 24 by 24-ft. cells and then 30 by 30-ft. cells, the "excellent" water-air mixture on the 6 by 6-ft. cell could not be duplicated on the larger ones. It was assumed that the air-water ratio would be equalized in all areas of the cooling chamber, as had been demonstrated in test cells. In-service tests of large units disproved this assumption. Air-discharge area and fan size had not retained the original relationship to plan area; as a result, air flow tended to establish a conical pattern from intake louvers to discharge area, devitalizing areas outside this zone.

When demands for increased capacities dictated multicell units, performance imbalance again occurred. The four louvered areas of the single-cell tower were successively reduced to three, then two, and in the back-to-back installations, only corner cells had more than a single air-intake area. Here again empirical penalties, assessed to compensate for static-pressure loss thus incurred, usually proved to be somewhat optimistic when towers were subjected to authentic tests.

In addition, engineers had always considered that there was an unlimited

**What designers consider in fungus attack:**



**TO PREVENT AIR PULSATION,** fan cylinders are braced, wrapped with angle iron, and made oversized to give greater tip clearance.

*Congrats and $25 for this quip to DEAN H. CROWELL, 5919 Vickery Boulevard, Dallas, Texas*

Joe Roughneck's seen dusters in his day, but he's brought in many a producing well, too. And throughout the years, Joe's been the one to specify Lone Star API pipe. He knows it's tough, dependable and available conveniently in the heart of the oil country.

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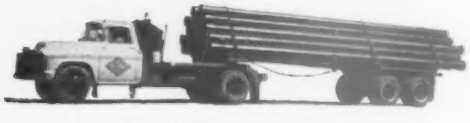

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amount of dry air available to supply the intake areas of any cooling tower. As towers became longer and the larger fans began demanding more air, it was found that the center cells of long cooling towers were being starved for dry air.

On the leeward side of a long cooling tower, a low-pressure area was created, which caused the saturated vapor from fan cylinders to be pulled down through the tower cell. Small compensation was made but it was not until recently that manufacturers realized the penalty they would have to add to any long cooling tower to make up for this recirculation problem.

**Inlet temperature.** One forward step in simplifying the testing of cooling towers was taken by major manufacturers in 1955. The custom had been to measure the "inlet or average" wet-bulb temperature at six points with a sling psychrometer—three stations on each louvered side of the cooling tower, simultaneously.

On longer towers it was found that the wet bulb at the center of the tower would be considerably higher. There was always a question on just how to set up the "average or inlet" temperature. Worst of all, it was the responsibility of the cooling-tower buyer to try to determine how much recirculation he might have on his proposed tower, and to specify a higher wet bulb to compensate for cooling-tower recirculation.

Then manufacturers agreed for the first time to use an ambient wet-bulb temperature. The ambient wet bulb was measured by walking away from the cooling tower 50 ft. directly into the wind and taking all wet-bulb readings at that one station. Not only did this simplify taking a wet-bulb reading, but it became the responsibility of each manufacturer to determine how much recirculation he must "build in" to a cooling tower.

Cooling towers today are sized and rated more accurately than ever. With users designing plants on closer budgets, they can no longer afford to specify a 5° F. approach to the wet bulb in order to make certain they get an 8° or 10° F. approach.

### Fungus Attack on Redwood

Killing fungus in a cooling tower is a problem. It is generally agreed if the fungus attack is in the center of a thick member, there is no commercially available treatment that will kill the fungus. If the fungus is in thinner members or on the outside of heavier members, it can be killed.

The most popular type of "permanent treatment" is the double-diffusion

method. Basically, copper or zinc sulfate is applied to soaking wet wood in the form of a heavy slurry. These toxic chemicals diffuse in the wood. Since the metallic salts are water soluble, a single diffusion treatment would only be temporary.

After allowing the first application to diffuse into the wood for 48 hours, the tower is treated again with another slurry made up of sodium chromate. This second solution diffuses into the wood and the metallic salt precipitates out as chromate and other complex chemicals which are insoluble and highly toxic.

This type of treatment, applied on reasonably new towers or on towers where the fungus is on the outside of members only, will kill that fungus and will form a protective layer which prevents fungus from infecting the tower.

Some users have applied concentrated solutions of fungicides, usually pentachlorophenol, to the circulating water, and have sprayed the "dry area" of the tower with garden-type sprayers to kill fungus. Results at this time are inconclusive, and the amount of labor involved on semiannual or quarterly basis for hand spraying the "dry area" is considerable.

Redwood and fir definitely appear to be the best cooling-tower woods, although untreated redwood and untreated fir lath have shown severe decay in tests.

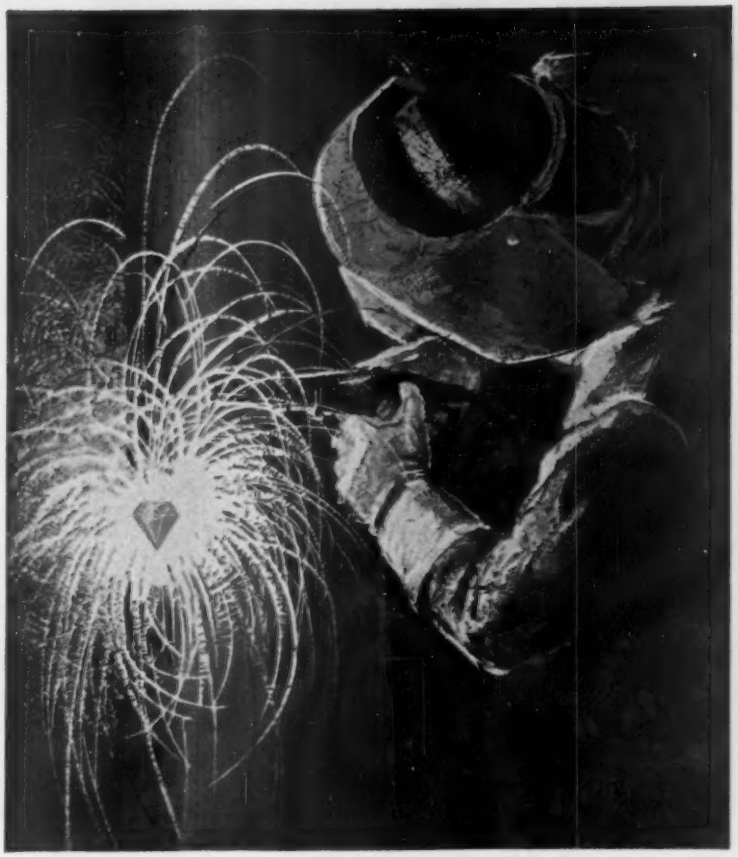
While there is a difference of opinion as to which treatment is best, it is generally agreed that chromated copper arsenate and creosote are among the better treatments, whether the wood is redwood or fir.

Many buyers are specifying that prefabricated wood materials be pressure-treated before the tower is erected. Chromated copper arsenate is popular because it is a "clean treatment," is less costly than creosote, and does not require the labor that creosoted materials need.

**Alternate materials.** Mainly as a result of redwood failures, alternate materials are being tried in cooling towers. In addition, since corrosion is always a problem on metallic parts, more corrosive-resistant materials are being introduced to replace metallic components.

Plastics appear to be the most promising, and considerable experimentation and use has been made of the polyethylenes and glass-reinforced polyesters. Styrene is used on a more limited basis, but it is subject to burning and tends to disintegrate rapidly if exchanger leaks allow hydrocarbons to get into the circulating water.

Even the most enthusiastic plastic

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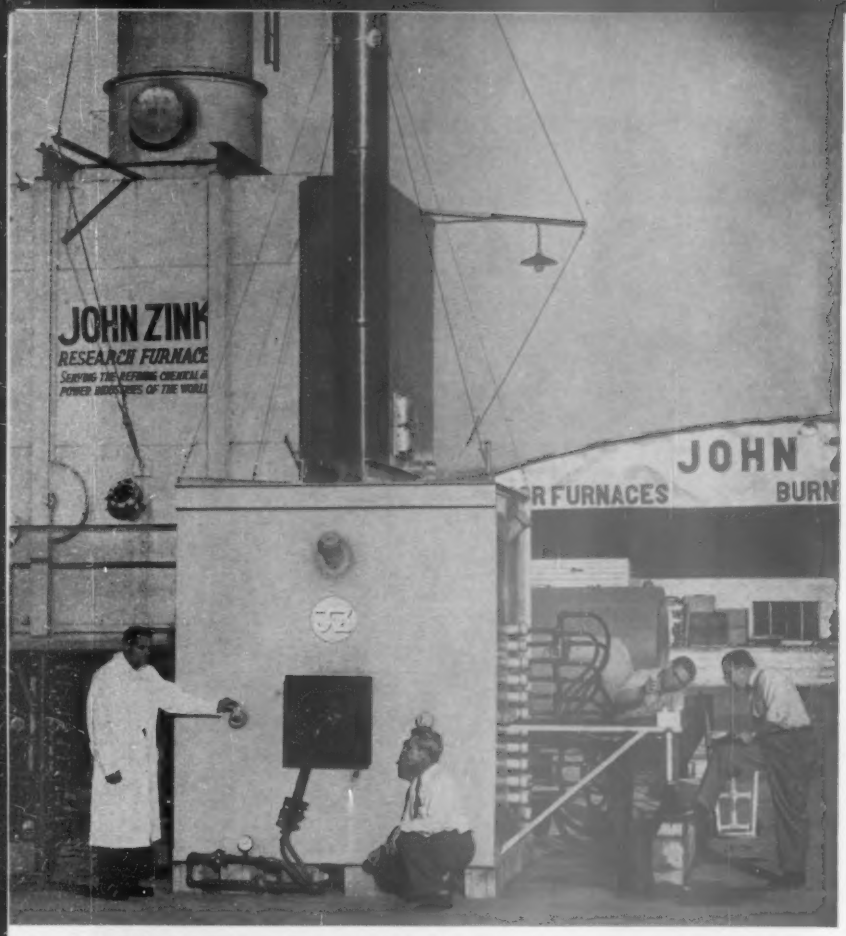


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salesmen will admit that plastics will not compete with treated redwood on price. Cooling-tower manufacturers have tried to use suitable plastics where the price will compete with the wood or metal they are replacing.

Polyester-reinforced glass fiber is being used in cooling towers in the form of hanging grids to position and support redwood-fill splash bars. The saving fabrication of members requiring mortising, plus the saving in field erection time, allows the more expensive grids to compete with redwood supports.

Fan blades made of glass-reinforced polyester cost but little more than aluminum-alloy or stainless-steel blades; hence are offered as an alternate material.

Redwood-stave pipe bands out of this same material are replacing metal bands. Timber-ring connectors made of hot-dip galvanized steel or stainless-steel rings are now available in glass-reinforced polyester or in structural porcelain. Diagonal connector straps, traditionally made of metals, are now being furnished from glass-fiber-reinforced polyester.

Pressure-treated marine-fir plywood has been used for the past decade as notched spacers to hold eliminator blades, and is now used in water basins and flumes also. Some of the new waterproof plastic glues, which plywood manufacturers are currently using for their exterior plywood, have made this possible. This treated fir plywood is highly resistant to fungal attack and delamination, and has an excellent service life.

Corrugated asbestos-cement board began replacing double redwood casing on cooling towers serving the air-conditioning industry immediately following the war. Corrugated asbestos-cement board panels can be lapped horizontally and vertically, and sealed watertight. This casing material gives a much more pleasing appearance to outside casing than the traditional stained double redwood casing walls.

Asbestos-cement board is noncombustible, which gives an added bonus, and will take paint very nicely. More recently, cooling-tower manufacturers have used cement-asbestos board for louvers. By going to this material, wider louvers may be used, which results in a dryer area around the tower and does away with stained wooden louvers.

All of these alternate materials are out of the experimental stage, and are available as standard components from many cooling-tower manufacturers. Each one has been tested carefully, and companies that operate and buy cooling towers approve and seek out these alternate materials.

# The how and why of counterbalance

BY JOSEPH ZABA

SO FAR we have talked about motions, forces, and loads. Consideration of counterbalance and of related subjects introduces the concepts of energy, work, power and torque. Here are some definitions of these terms that may be helpful.

**Energy** is ability to perform work. Energy stored in the counterbalance during the downstroke of the pumping cycle helps lift the load of rods and fluid during the upstroke.

**Work** is a product of weight and distance. When a force F moves a body over a distance S it performs work W and $W = F \times S$. With force expressed in pounds and distance in feet the work is given in foot-pounds.

**Power** is the rate of doing work. $P = W/T$ where P denotes power needed to perform, at a constant rate, work W in time T. The average, constant velocity V equals distance S divided by time T. Therefore,

$$P = W/T = F \times S/T = F \times V$$

**Horsepower** is the practical unit of mechanical power, or the power necessary to lift 33,000 lb. 1 ft. in 1 minute.

**Torque** is a measure of a force tending to produce rotation and the product of force and the lever arm. Applied to pumping-unit calculations, the force is expressed in pounds, the lever arm in inches and the resulting torque in inch-pounds. The relation between torque tending to produce rotation of the shaft and power transmitted by the shaft is expressed by the formula:

$$T = \frac{53,025 \times hp.}{N}$$

where:

T = Torque, in.-lb.
hp. = Horsepower
N = r.p.m. of the shaft.

**Work during the cycle.** Most of the work of lifting the fluid by a sucker rod pump is done during the upstroke of the cycle. The load of rods and fluid must be accelerated from zero velocity and must be lifted the full length of the stroke. On the downstroke, with fluid weight transferred to the tubing, the rod load becomes negative and the falling rods act as a driving force for the system. If some means were not provided to equalize these loads, the unbalance of forces would damage the surface equipment. Unnecessarily high demand for power would occur during the upstroke with the prime mover being actually driven during the downstroke, and high torque would be imposed during the upstroke. Counterbalance provides for even distribution of loads and for reduction of peak horsepower and peak torque.

The importance of proper counterbalancing can not be overemphasized. In selecting new equipment, proper counterbalancing permits the purchase of a smaller prime-mover transmission. In case of installations already in operation, maintaining proper counterbalance reduces the costs and operating problems and prolongs the life of equipment.

**Effective counterbalance.** Let's define some more terms. **Actual counterbalance** is the actual weight of the counterbalance weights used. **Effective counterbalance** is the counterbalancing result which the weights exert. This result is a function of position of the weights in relation to the points of leverage of the pumping unit and, in case of beam counterbalance, also a function of speed of operation.

**Counterbalance requirements.** An ideal counterbalance would equal the load of rods plus half of the load of fluid. During the upstroke, the static polished-rod load consists of weight of rods plus weight of fluid. The net polished-rod load, with ideal counterbalance, would be half of the fluid load. On the downstroke the net load would equal the counterbalance load less the weight of the falling rods, or again the weight of the half of fluid. The net loads in both halves of the cycle would be equal.

This relationship assumes that the downstroke loading of the installation equals the weight of rods. Actually, this is not the case. Expressing the counterbalance as an average of maximum and minimum loads by formulas given in Installment 7 of this series:

$$C_B = \frac{P + M}{2}$$

$$= 0.937\, W_r + W_f/2$$

where:

P = peak polished-rod load, lb.
M = minimum polished-rod load, lb.
$W_r$ = weight of rods in air, lb.
$W_f$ = weight of fluid, sp. gr. = 1.0

The concept of counterbalance as a percentage of the peak polished-rod load was discontinued as pumping depths increased, with a corresponding increase in the ratio of rod weight to fluid weight. For shallow or moderately deep pumping a counterbalance representing 60% of peak polished-rod load was generally satisfactory. In 1952 the API Mid-Continent District Study Committee on Artificial Lifting of Deep Wells reported on its 2-year study of the subject.[1] The committee defined a "deep" well as one having working fluid level below 7,000 ft. or one having the working fluid level between 5,000 and 7,000 ft. and a production of 500 bbl. per day or more. The report revealed that for 43 wells with working fluid levels from 7,000 to 10,000 ft., the effective counterbalance ranged from 84 to 90% of the peak polished-rod load. A more recent study showed that in 21 wells pumping from 7,050 to 13,000 ft., the actual counterbalance ranged from 71.6 to 100% of the measured peak polished-rod load.[2]

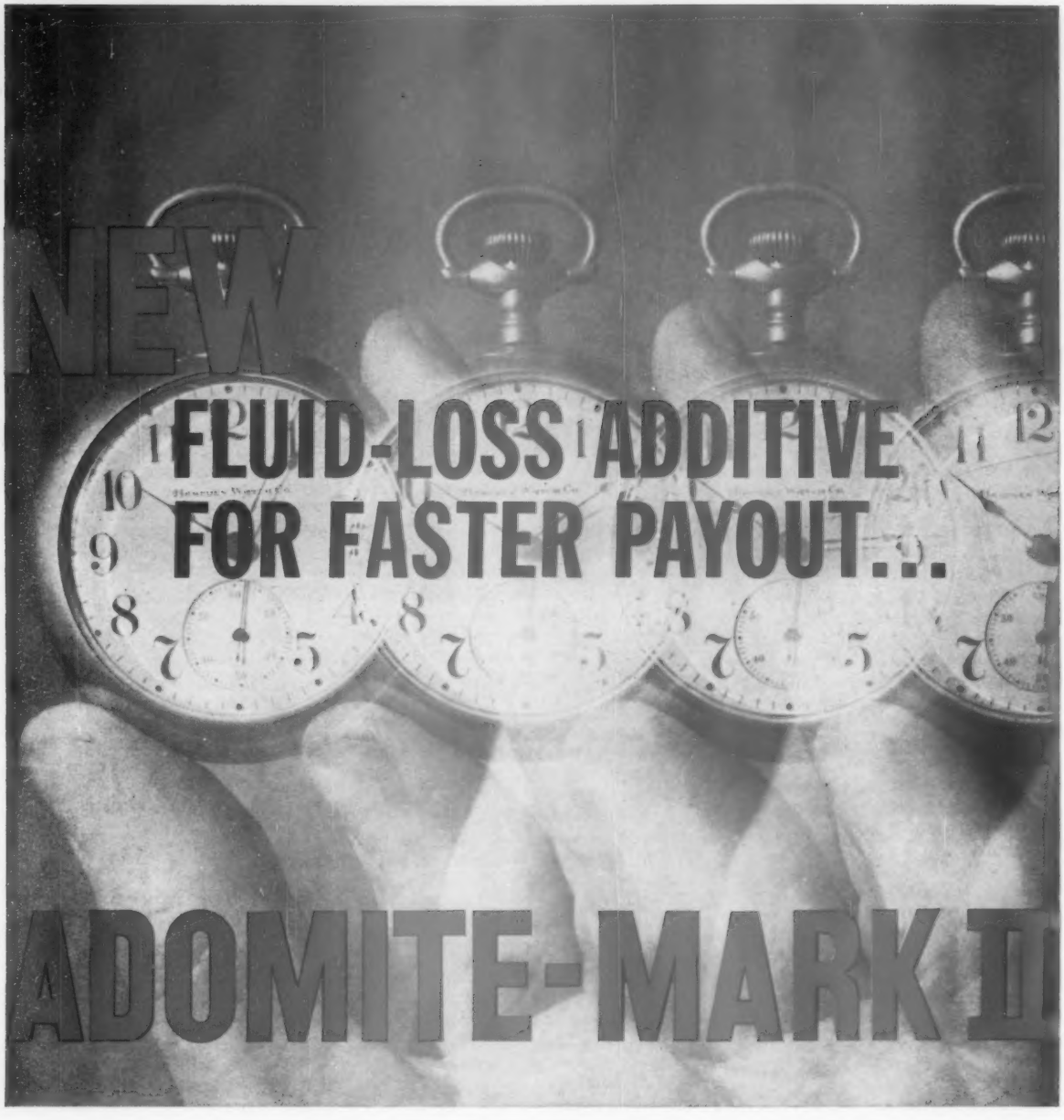
A special committee of pumping-unit manufacturers is now working on the proposed pumping-unit series standards. In the formula expressing the relationship between structure capacity of the unit and the unit's peak torque capacity and maximum stroke, the committee assumed counterbalance effect equaling 75% of the polished-rod load as a practical maximum value for most conditions.

Because of the importance of counterbalancing, this subject will be considered in more detail later in conjunction with a discussion of surface pumping equipment.

### References

1. API Mid-Continent District Study Committee on Artificial Lifting of Deep Wells—J. Zaba, chairman; "Artificial Lifting of Deep Wells": Drilling and Production Practice, API—1952, p. 148.

2. Thompson, Marvin J., "Know Your Well Loads": The Oil and Gas Journal, April 27, 1959.

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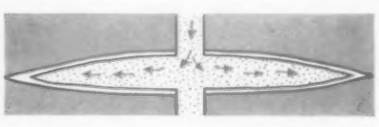
**ADOMITE®**  *. . . fluid-loss additives*

# 12,600 bbl. of liquids daily

## from

# 169 M.M.c.f. of wet gas

## . . . that's the design basis for a new $3,855,000 gas plant in Texas

BY H. C. BOZEMAN
Gulf Coast Refining Editor

HERE ARE some other interesting features of Texas Eastern Transmission Co.'s Rayne, La., plant:

- **Construction costs** were lowered by producing only two products: a stabilized condensate stream and a propane-butane-condensate mixture.
- **Texas Eastern owns** the estimated 1 trillion cubic feet of gas reserves at Rayne field. However, the liquids are owned by Continental Oil Co., General Crude Oil Co., M. H. Marr, and Sun Oil Co.
- **Two stages of separation** are made before the gas is contacted with absorption oil.
- **No recompression** is necessary to deliver the residue gas to the pipeline after hydrocarbon removal.
- **Power recovery turbines** drive cooling-water pumps and a process pump.

La Gloria Oil & Gas Co., a Texas Eastern subsidiary, operates the plant, and Brown & Root, Inc., built it.

The plant design efficiencies at a residue gas volume of 155 M.M.c.f. daily are recovery of 75% for propane, 95% for butane, and 100% for heavier hydrocarbons.

### Rayne Gas Field

The discovery well was drilled in 1953 by Continental Oil and in July 1954 a stepout confirmed the field. Now, Rayne field has 21 completed wells and covers an area of about 4,800 acres.

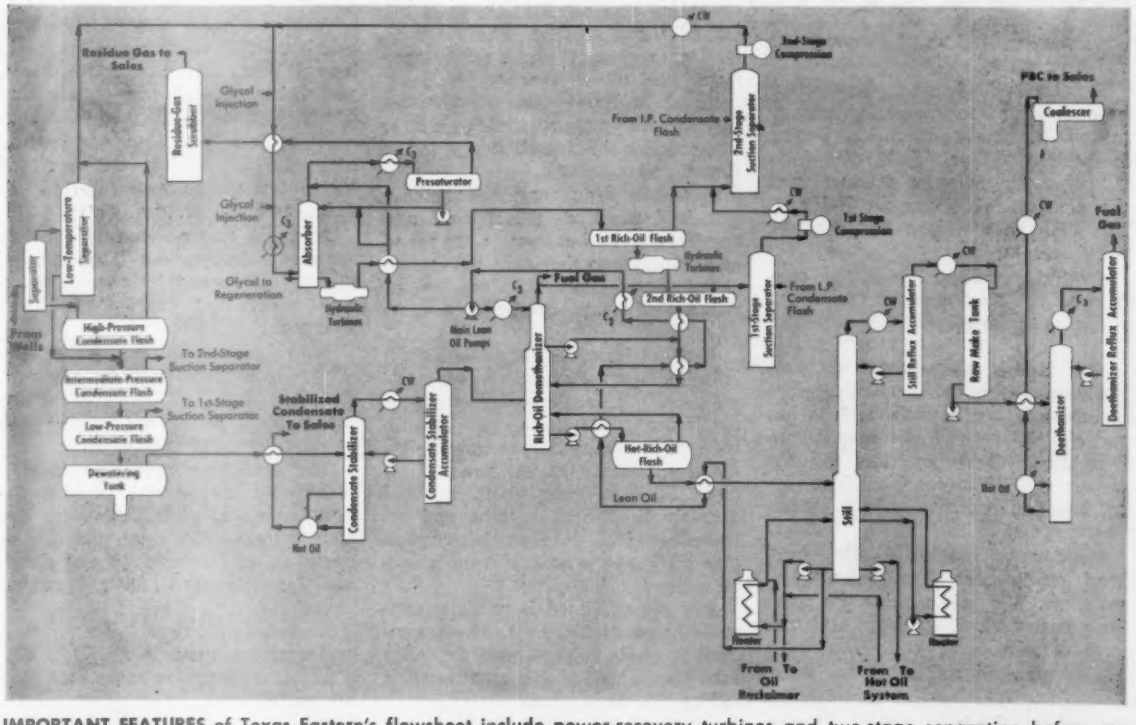
In mid-1959, Texas Eastern purchased all the oil and gas leases and related rights and production equipment at Rayne field owned by Continental, General Crude, M. H. Marr, and Sun.

The sellers reserved rights to oil and all rights below the deepest known producing sand, and reserved a production payment out of separator and natural-gas liquids.

Texas Eastern paid $12,420,500 in cash and will pay $121,975,000 over the next 16 years for the field (OGJ, Sept. 14, 1959, p. 66-67).

### The Process

Gas and liquids flow from the wells to the 21 individual well separators at 2,900 psig. where separation is made into gas and condensate streams.




**IMPORTANT FEATURES** of Texas Eastern's flowsheet include power-recovery turbines and two-stage separation before gas is contacted with absorption oil.

## Table 1—Analyses of Product Streams

| | Residue gas mole % | Propane-Butane condensate mole % | Stabilized condensate mole % |
|---|---|---|---|
| Carbon dioxide | 1.37 | .... | .... |
| Methane | 93.25 | .... | .... |
| Ethane | 4.72 | 1.61 | .... |
| Propane | 0.63 | 54.01 | 0.15 |
| Isobutane | 0.02 | 16.23 | 2.09 |
| N-Butane | 0.01 | 15.81 | 4.69 |
| Isopentane | .... | 4.42 | 4.62 |
| N-Pentane | .... | 2.68 | 3.78 |
| Hexane | .... | 3.57 | 14.30 |
| Heptanes plus | .... | 1.67 | 70.37 |

The separators are located on the edge of the plant site; the only equipment located at the well heads are chokes and flow line heaters.

The gas from the well separators is combined and fed to four low-temperature separators.

**Condensate processing.** Condensate from the well separators flows to the 1,250-psig. high-pressure flash. The flash gas combines with the main gas stream from the low-temperature separators to the absorbers.

Condensate from the high-pressure flash is joined by condensate from the low-temperature separator and both flow to the 525-psig. flash. Condensate is flashed again in the 210-psig. low-pressure flash. Dewatered condensate is fed to the condensate stabilizer tower.

Stabilized condensate, the bottom product, is sent to storage for delivery to two pipeline connections. Design is for 373,000 gal. daily of 5.5 to 6.0-psi.-vapor pressure product with the composition shown in Table 1. The plant has storage for about 1 week's production.

Overhead product from the condensate stabilizer tower is fed to the rich-oil demethanizer.

**Gas liquids processing.** The main gas stream from the low-temperature separator is cooled with residue gas and chilled to 40° F. by propane refrigeration before entering the absorbers at 1,235 psig. Diethylene glycol injection prevents hydrate formation.

Residue gas from the absorber overhead presaturates lean oil of 160 mole. wt. The cold residue gas from the presaturator is scrubbed and metered to sales.

The plant is connected to Texas Eastern's 30-in. main transmission line via a 14-in.-diameter, 22-mile lateral from the Opelousas station. Design capacity is 155 M.M.c.f. of residue gas with composition as shown in Table 1.

Pressure of the rich oil from the absorber bottoms is reduced to 540 psig. through two hydraulic turbines that drive the cooling-water circulating pumps. The cold rich oil is then flashed at 525 and 210 psig. Between these two flashes a third hydraulic turbine recovers power to drive the still-bottoms reboil pump.

Rich oil from the 210-psig. flash is heated by hot lean oil before entering the demethanizer. Demethanizer-bottoms rich oil is flashed and vapors serve as stripping gas.

The upper section of the demethanizer is a reabsorbing tower. A sidestream of lean oil is drawn from the second stage of the main lean-oil pumps to contact vapors stripped from rich oil in the tower's lower section. Rich oil from the bottom tray of the reabsorber section is pumped into the rich-oil stream to the demethanizer.

Overhead gas from the demethanizer, and gas from the rich oil and condensate flashes are compressed and returned to the main gas stream ahead of the absorbers. Also, some of the demethanizer overhead goes to plant fuel.

Rich oil from the hot rich-oil flash is heated and enters the still for stripping. No outside stripping steam or gas is used. Heat is supplied at both the still bottom and four trays below the feed tray. Oil is removed at 590° F. from each point, pumped through direct-fired heaters, and returned at 595° F. Each heater supplies 50% of the heat. Hot oil is supplied from still bottoms.

Still overhead is partially condensed and refluxed. The uncondensed gas is further condensed and then the combined gas and liquid is fed to the deethanizer.

Overhead gas goes to the plant fuel system.

The propane - butane - condensate, the deethanizer-bottoms product, is piped to two pipeline connections after going through a coalescer. Design is for 180,000 gal. of product daily with a 120-psi. vapor pressure at 100° F., and composition as shown in Table 1. The plant has storage capacity for about 1 day's production.

### Mechanical Features

Four compressors handle recompression of flash-gas, demethanizer overhead and propane refrigerant. Two units are 1,100-b.hp. Cooper-Bessemer GMV-10's, one is a 1,000-b.hp. Cooper-Bessemer GMV-10, and one is an Ingersoll Rand KVG-10. Three units can meet the compression needs at the design rate of 155 M.M.c.f. of residue gas.

**Pumps and utilities.** The two main lean-oil pumps are driven by 680-b.hp. gas engines through speed increasers.

Three gas-engine-driven generators furnish 560 kw. of electrical power for other pump drives and lighting. A 40-kw. gas-engine-driven generator is installed for emergency lighting.

A 3,000-lb. per hour, 25-psig. steam boiler provides steam for tracing and utility needs.

Cooling water is supplied by a single induced-draft, crossflow tower of 7,800 g.p.m. capacity. Fire water is taken from the cooling-tower basin and makeup is from two water wells.

A closed-jacket water cooling system is used by the compressors, main lean-oil pump drives, generator drives, and instrument air compressor and cooler. Makeup is inhibited rainwater.

All engines have automatic lube-oil makeup. Each engine has a closed lubrication system with full-flow filtering and temperature control.

A single moter-driven compressor supplies instrument air. Engine starting air is supplied by two compressors, which also supply utility and emergency instrument air.

Individual monthly production tests are made on two fixed test units in the plant yard. The liquids are measured and the gas streams are analyzed by chromatographic analysis.

The processing equipment is built entirely of carbon steel and insulation is covered with aluminum. The plant employs 20 men, including 8 operators and helpers (2 per shift), and 7 maintenance men and roustabouts.

Audible and visual alarms warn operators of upset conditions. The plant is divided into three areas for the audible alarms: processing with a horn, engine with a whistle, and heater with a siren.

# what's your best estimate?

*. . . a quiz for refinery men who want to keep posted*

**QUESTION 1.** At the close of World War II, the vast nation of India had two petroleum refineries with a total capacity of only 10,000 B/D. Today, one of these original production units and three new ones are turning out oil products for India at a considerably greater rate. What is the total crude capacity of India's four operating refineries?

*a* ▮▮▮▮▮ 43,000 B/D

*b* ▮▮▮▮▮▮▮▮ 76,000 B/D

*c* ▮▮▮▮▮▮▮▮▮▮▮ 107,000 B/D

*d* ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮ 144,000 B/D

**QUESTION 2.** What per cent of India's present refining capacity has been designed, engineered and constructed by Lummus?

*a* % % % % 39%

*b* % % % % % % 63%

*c* % % % % % % % % % 91%

---

**ANSWERS: 1.** *(c)—or 107,000 B/D—is the right answer.*

**2.** *(c) again—or 91⅞ is correct. Lummus has built all three of India's postwar refineries, with a combined capacity of 97,500 B/D, through The Lummus Company Ltd. of London. Lummus Ltd.'s organization maintains a staff of over 400 specialists, and has engineered and constructed hundreds of process plants of all types and sizes, from India to Ireland. Lummus Ltd. is one of several international members of the Lummus group of companies which circles the globe. See Lummus on your next project.* *Statistics according to World Petroleum.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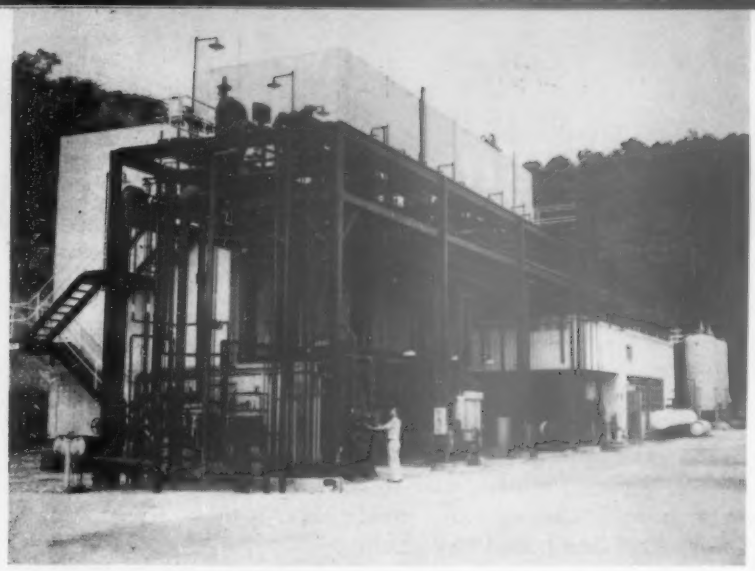
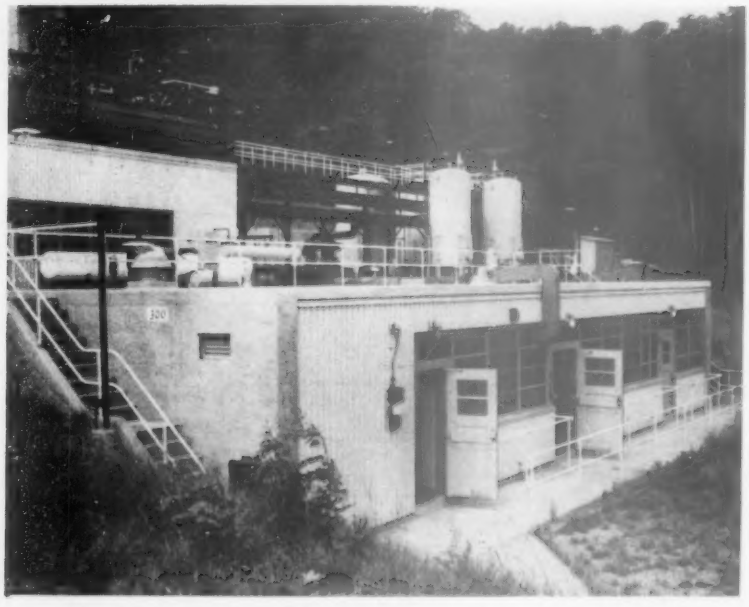


**PLACING REACTION EQUIPMENT** in reinforced-concrete cells which are open at the top and north side facing a hill . . .



. . . and locating all equipment that must be manually operated on the south side of the cell structure have proven that . . .

# Good design and layout can tame hazardous area

BY D. G. SANTINI
Union Carbide Chemicals Co.
Institute, W. Va.

AT its Institute, W. Va., plant, Union Carbide is producing peracetic acid, for making epoxy plasticizers and resin intermediates, by the oxidation of acetaldehyde to acetaldehyde monoperacetate. This intermediate is converted to peracetic acid and acetaldehyde. Both peracetic acid and acetaldehyde monoperacetic are unstable compounds that under certain conditions will decompose with explosive violence.

Because of the unstable and hazardous nature of the materials handled, an unusual emphasis has been placed on safety considerations in the design and operation of this plant. Advantage was taken of a hillside location to obtain physical separation of process materials and personnel, and to use gravity flow for flushing equipment and emergency dumping.

Safety features provide twofold protection. The first, and most important, is to operating personnel; and second is to prevent, if possible, or minimize equipment damage. A "defense-in-depth" concept was used wherein only simultaneous or sequential failure of all of the independent forms of protection would result in personnel injury or extensive equipment damage.

**Location.** Being located on an adjacent hillside effectively isolates the manufacturing and storage facilities for peracetic acid from other nonrelated production facilities. Also, being located on a hillside allows the gravity feed of flushing solvent, from a tank located above the unit, through the processing equipment into underground dump lines which terminate in a flare pond on a plateau below the processing equipment and storage tanks.

**Processing equipment** is located in one of five reinforced concrete cells which are open at the top and north side facing the hill. Corridors between the cells permit access to any cell without exposure to equipment in any other cell. Pumps, operating hand valves, motor valves, pressure gages, and indicating thermometers are located on the south side of the concrete cell structure so that manual operations can be effected without personnel exposure to potentially hazardous equipment.

**The control room,** considered a safe haven in the event all other safety devices fail, is located about 100 ft. from the cell structure and below grade level. It is an air-conditioned building in which three walls and the roof are fabricated or reinforced concrete and the south side, which is above grade by reason of the hillside location, consists of insulated metal siding and tinted vinyl plastic glazing. Communication between the control room and the structure is by means of a sound-powered telephone system.

**Equipment design.** Wherein applicable, all equipment in hazardous service was designed and fabricated to conform to the ASME code. Major pieces of equipment in hazardous service are designed for working pressures which will contain a vapor-phase explosion. Extensive provision was made to prevent contamination of process materials. All processing equipment is spray-protected against possible fire exposure.

# CB&I CRYOGENIC STORAGE VESSELS for

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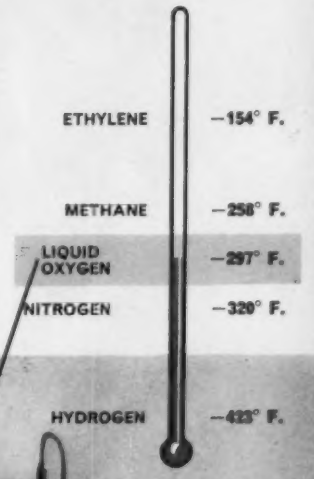
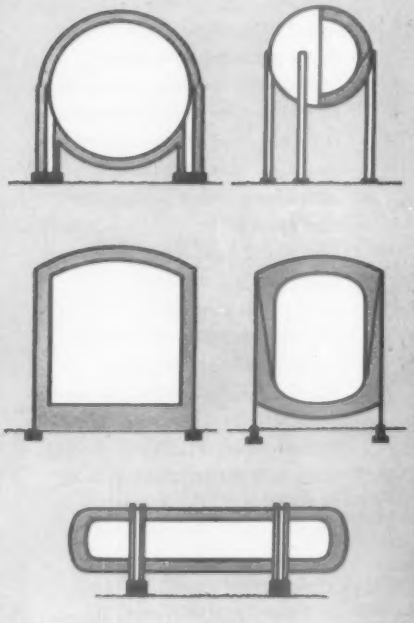



**CRYOGENIC STORAGE VESSELS**



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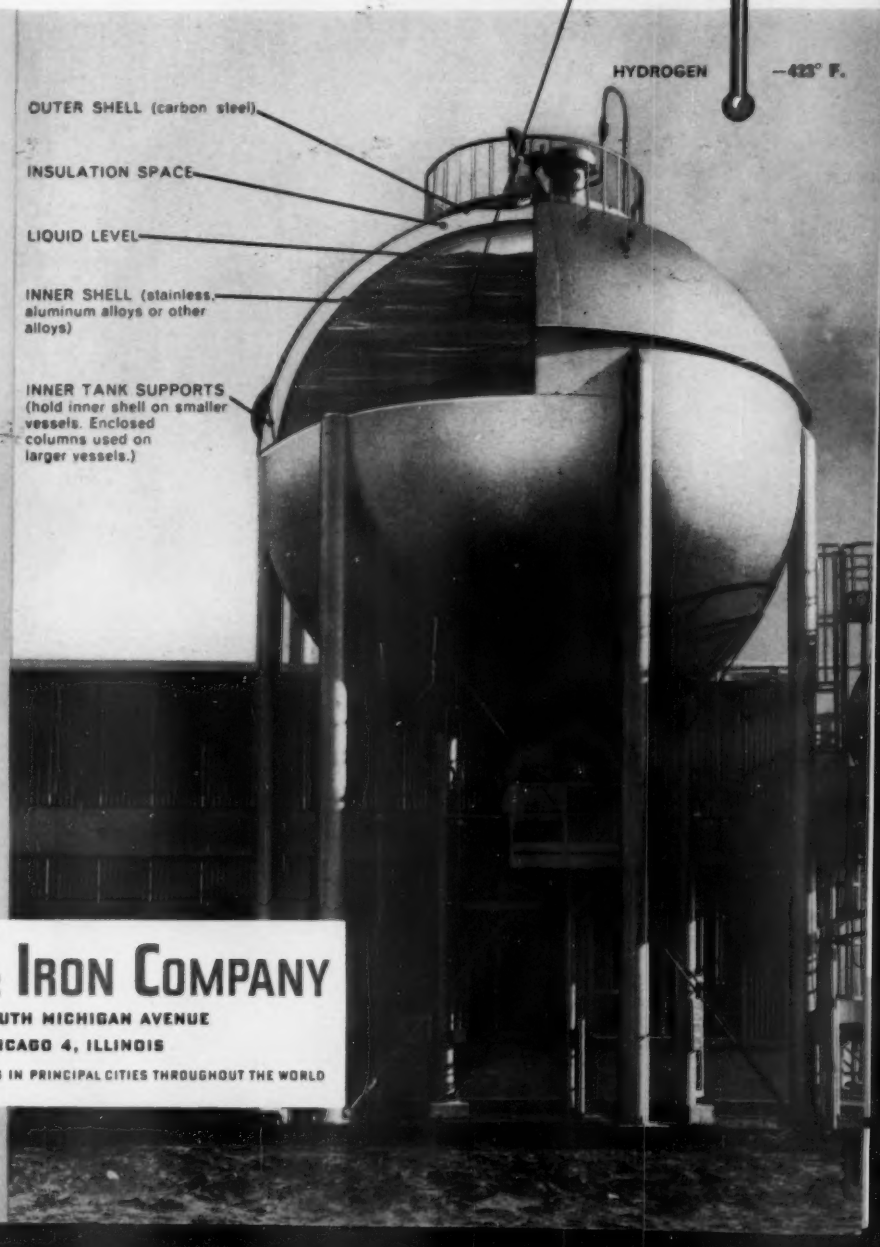
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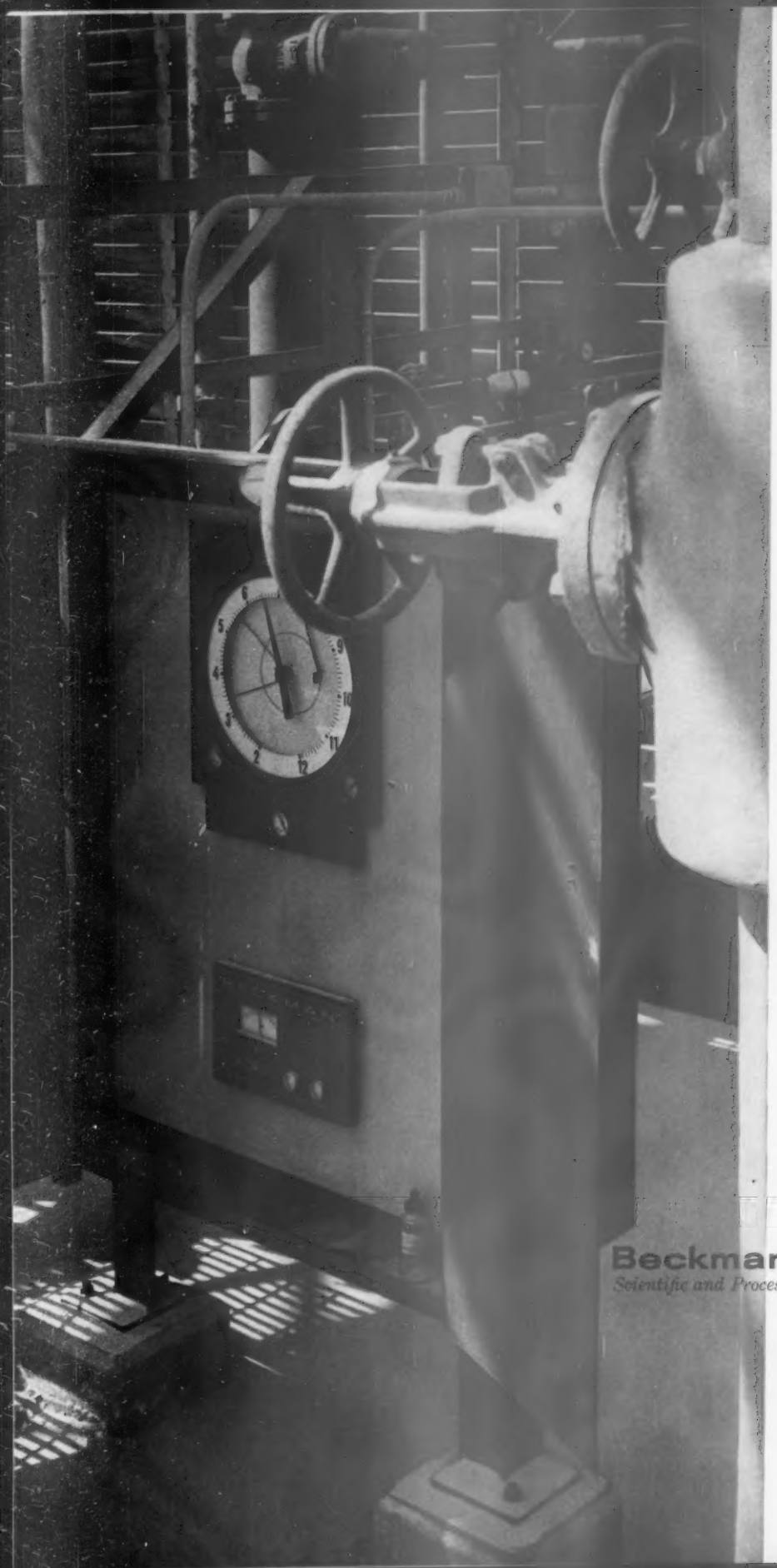

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Questions on

TECHNOLOGY

BY W. L. NELSON
Technical Editor and
Petroleum Consultant

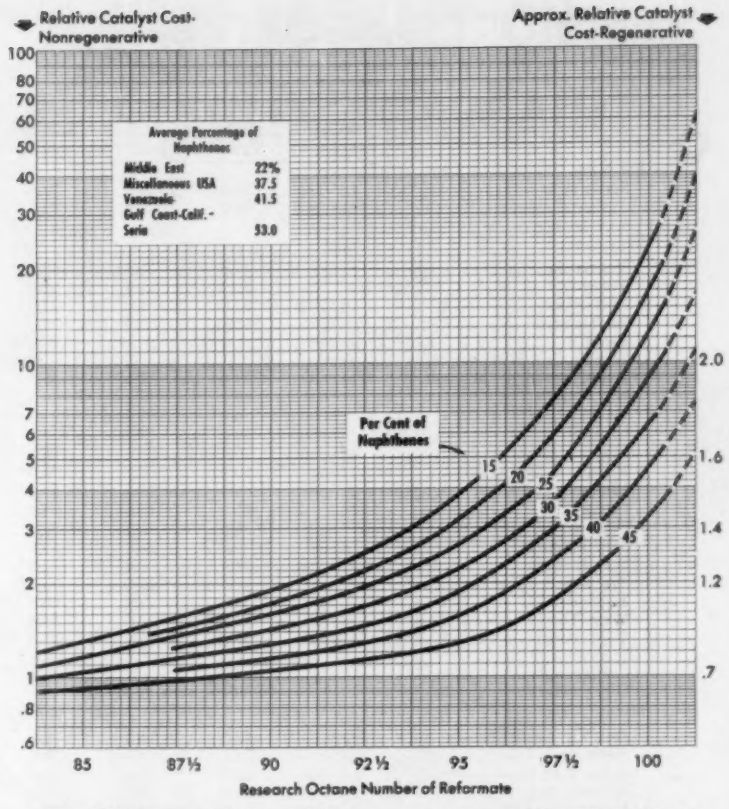
# Feed composition and catalyst cost in catalytic refining

**In your Process Costimating No. 56 of September 14, 1959, you dismiss catalyst cost as simply ranging from 4 to 8 cents per barrel. Is not catalyst cost the major consideration, at least when operating for 95-98 octane number? S.W.T.**

Catalyst cost is indeed vital. However, if the catalyst cost (or its equivalent) exceeds about 8 cents per barrel, the feasibility of the reforming operation begins to be doubtful and hence 8 cents per barrel in Process Costimating No. 56 was selected as an upper limit.

The literature on catalyst life is entirely unsatisfactory because of variations in severity, type of feed stock, amount of regeneration (if any), etc. However, a search of the literature indicates that catalyst life is altered by feed composition somewhat as shown in Fig. 1. The relative amount of catalyst required is shown for nonregenerative operation on the left scale, and for regenerative operation on the right scale. Although catalyst consumption can be limited to very small amounts by an increased use of regeneration up to at least four reactor stages, it must be recognized that investment-type charges (maintenance, interest or dividends, insurance, taxes, etc.) mount rapidly as more and more regeneration is practiced. In the extreme, such costs (1956) may increase by 10-15 cents per barrel. This is still better at the 100-octane level than to pay for large amounts of catalyst, but the 10-15 cents per barrel is not an insignificant cost.

Tables 1 and 2 indicate the naphthene content of the reformer feed stocks derived from well-known world crude oils. The feed stocks from naphthenic or asphaltic crude oils (Gulf Coast, California, or the Far East) are the best although most Venezuelan oils are nearly as good. Middle East oils




**APPROXIMATE EFFECT** of naphthene content on cost of catalyst. Fig. 1.

**TABLE 1—NAPHTHENES (AND AROMATICS) IN VARIOUS U. S. CATALYTIC REFORMING FEED STOCKS**

| | Weight Per Cent | | | |
|---|---|---|---|---|
| | Naphthenes | Aromatics | Naphthenes & Aromatics | Reference |
| Arkansas | 15.0 | 8.0 | 23.0 | 2 |
| North Texas | 14.0 | 8.4 | 22.4 | 1 |
| Pennsylvania | 27.7 | 11.1 | 38.8 | 3 |
| South Texas | 30.3 | 7.3 | 37.6 | 1 |
| East Texas—Nat. Gaso. | 20.0 | 6.0 | 26.0 | 6 |
| East Texas | 47.6 | 9.2 | 56.8 | 1 |
| East Texas | 46.7 | 11.3 | 58.0 | 1 |
| East & West Texas | 40.0 | 15.0 | 55.0 | 4 |
| East & West Texas | 46.0 | 12.0 | 58.0 | 4 |
| East & West Texas | 42.0 | 15.0 | 57.0 | 4 |
| West Texas | 38.7 | 20.8 | 59.5 | 1 |
| West Texas—Mid. Cont. | 44.0 | 9.0 | 53.0 | 4 |
| Mid Continent | 38.0 | 8.0 | 46.0 | 8 |
| Mid Continent | 36.1 | 15.7 | 51.8 | 1 |
| Mid Continent | 41.5 | 8.5 | 50.0 | 2 |
| Mid Continent | 43.2 | 7.7 | 50.9 | 3 |
| Mid Continent | 36.2 | 12.5 | 48.7 | 5 |
| Mid Continent | 43.9 | 10.4 | 54.3 | 6 |
| Mid Continent | 44.0 | 8.0 | 52.0 | 7 |
| Average | 37.5 | | 48.5 | |
| Gulf Coast | 34.0 | 16.8 | 50.8 | 1 |
| Gulf Coast | 36.4 | 16.8 | 53.2 | 1 |
| Gulf Coast | 51.0 | 14.0 | 65.0 | 5 |
| Gulf Coast | 55.5 | 18.5 | 74.0 | 2 |
| Gulf Coast | 63.0 | 9.0 | 72.0 | 7 |
| California | 59.6 | 13.0 | 72.6 | 1 |
| California | 70.3 | 11.4 | 81.7 | 6 |
| Average | 53.0 | | 67.0 | |

**TABLE 2—NAPHTHENES (AND AROMATICS) IN FOREIGN CATALYTIC REFORMING FEED STOCKS**

| | Boiling range, °F. | Weight per cent: Naphthenes | Aromatics | Naphthenes and aromatics | Reference |
|---|---|---|---|---|---|
| **Far East:** | | | | | |
| Seria, light | 185-310 | 54.0 | 18.0 | 72.0 | 9 |
| | 310-384 | 51.0 | 31.0 | 82.0 | 9 |
| **Venezuela:** | | | | | |
| Venezuela | ..... | 43.0 | 22.9 | 65.9 | 3 |
| Venezuela | ..... | 39.5 | 21.1 | 60.6 | 6 |
| Bachaquero | 212-342 | 67.0 | 6.0 | 73.0 | 9 |
| Bachaquero | gasoline | 68.0 | 7.0 | 75.0 | 9 |
| Lama | gasoline | 32.1-35.4 | 11.0-14.0 | 44.0-47.2 | 9 |
| Lama | gasoline | 41.4-51.5 | 14.2-18.3 | 55.6-69.8 | 9 |
| Las Cruces/Los Manuels | 185-310 | 35.0 | 10.0 | 45.0 | 9 |
| Las Cruces/Los Manuels | 310-384 | 39.0 | 17.0 | 56.0 | 9 |
| Leona | 212-342 | 30.0 | 23.0 | 53.0 | 9 |
| Leona | 342-392 | 44.0 | 23.0 | 67.0 | 9 |
| Mara | 185-310 | 23.0 | 15.0 | 38.0 | 9 |
| Mara | 310-384 | 32.0 | 22.0 | 54.0 | 9 |
| Merey | 212-342 | 45.0 | 13.0 | 57.0 | 9 |
| Merey | 342-392 | 71.0 | 15.0 | 86.0 | 9 |
| Oficina | ..... | 36.5 | 20.9 | 57.4 | 1 |
| San Joaquin | 185-310 | 40.0 | 24.0 | 64.0 | 9 |
| San Joaquin | 310-384 | 38.0 | 34.0 | 72.0 | 9 |
| Tia Juana | ..... | 46.0 | 10.0 | 56.0 | 8 |
| Tucupido | ..... | 32.5 | 28.0 | 60.5 | 1 |
| West Tara | 185-310 | 31.0 | 12.0 | 43.0 | 9 |
| West Tara | 310-384 | 37.0 | 18.0 | 55.0 | 9 |
| Average | | 41.5 | | 58.0 | |
| **Middle East:** | | | | | |
| Abqaiq, Saudi Arabia | ..... | 12.0 | 16.0 | 28.0 | 8 |
| Agha Jari, Iraq | 185-310 | 24.0 | 14.0 | 38.0 | 9 |
| Agha Jari, Iraq | 310-384 | 35.0 | 21.0 | 56.0 | 9 |
| Kirkuk, Iraq | 185-310 | 28.0 | 9.0 | 37.0 | 9 |
| Kirkuk, Iraq | 310-384 | 30.0 | 23.0 | 53.0 | 9 |
| Kirkuk-Ain Zalah | 185-310 | 25.0 | 9.0 | 34.0 | 9 |
| Kirkuk-Ain Zalah | 310-384 | 24.0 | 24.0 | 48.0 | 9 |
| Qatar | 185-310 | 17.0 | 15.0 | 32.0 | 9 |
| Qatar | 310-384 | 16.0 | 27.0 | 43.0 | 9 |
| Kuwait | ..... | 19.4 | 14.7 | 34.1 | 3 |
| Kuwait | ..... | 20.5 | 11.0 | 31.5 | 5 |
| Kuwait | ..... | 19.8 | 13.9 | 33.7 | 6 |
| Kuwait | ..... | 19.0 | 11.0 | 30.0 | 7 |
| Kuwait | ..... | 18.0 | 15.0 | 33.0 | 8 |
| Average | | 22.0 | | 38.0 | |

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## Solubility of water in hydrocarbons

**Can you suggest any literature regarding the amount of water in equilibrium in liquid hydrocarbons at given heat and pressure? Any suggestion will be sincerely appreciated. R.L.K.**

The effect of temperature and pressure on the equilibrium (or solubility) of water in hydrocarbons can be completely surveyed by referring to Chemical Abstracts which is published by the American Chemical Society and which is available in nearly all technical libraries. However, tabulated below are a few pertinent references which were readily available in the files of this department.

Kobayashi and Katz in Ref. 1 outline the situation completely for many hydrocarbons as well as gasoline and kerosine. The solubility of water is substantially the same in all hydrocarbons (except possibly the aromatic hydrocarbons). However, they present a correlation in which the (small) effect of molecular weight is isolated. The effects of both pressure and temperature are discussed. Complete equilibrium data on propane-water (Ref. 2) and 1-butene-water (Ref. 3) are also available. Additional sources of information will be found listed at the ends of the references listed here.

Reference No. 4 may be especially helpful because it contains a nomograph by which the equilibrium constants for water in propane, butane, hexane, naphtha, and kerosine can be obtained for various pressures and temperatures. Finally, the Fourth Edition of Petroleum Refinery Engineering, page 203, provides a small amount of data on the effect of temperature on solubility (Ref. 5).

The equilibrium constants for water in hydrocarbons are very high. Thus, the gaseous phase in equilibrium with the liquid is so rich in water (far above the solubility of water in the liquid) that condensation of the vapor results in a two-phase liquid system which consists of water and a saturated solution of water in hydrocarbon.

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5. Nelson, W. L., Pet. Refinery Engineering, 4th Ed., McGraw-Hill Book Co., N. Y., 1958.
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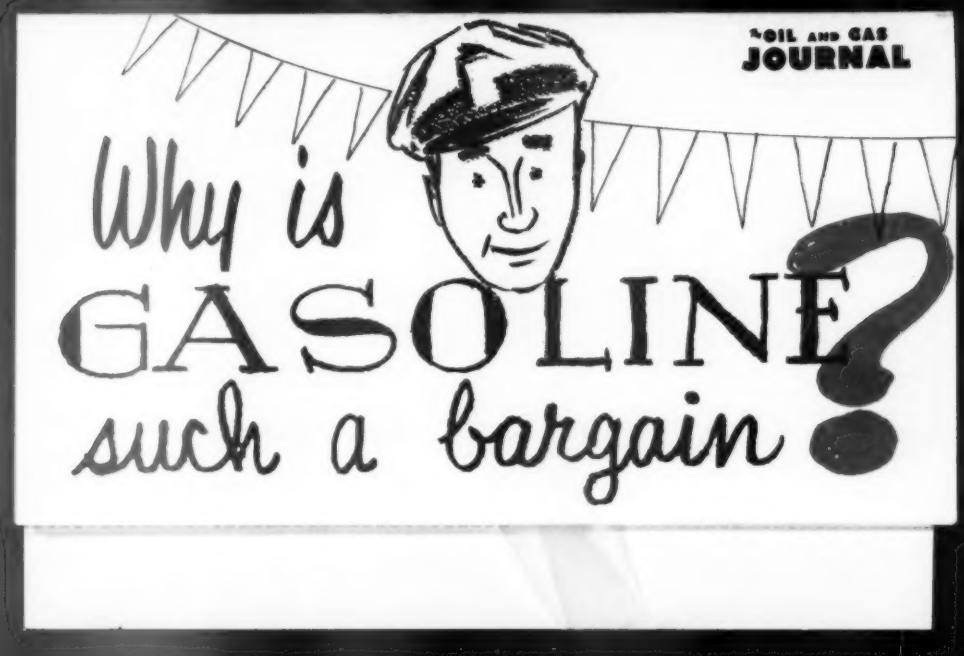
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| | Boiling range, ° F. | Weight per cent: Naphthenes | Aromatics | Naphthenes and aromatics | Reference |
|---|---|---|---|---|---|
| **Far East:** | | | | | |
| Seria, light | 185-310 | 54.0 | 18.0 | 72.0 | 9 |
| | 310-384 | 51.0 | 31.0 | 82.0 | 9 |
| **Venezuela:** | | | | | |
| Venezuela | ..... | 43.0 | 22.9 | 65.9 | 3 |
| Venezuela | ..... | 39.5 | 21.1 | 60.6 | 6 |
| Bachaquero | 212-342 | 67.0 | 6.0 | 73.0 | 9 |
| Bachaquero | gasoline | 68.0 | 7.0 | 75.0 | 9 |
| Lama | gasoline | 32.1-35.4 | 11.0-14.0 | 44.0-47.2 | 9 |
| Lama | gasoline | 41.4-51.5 | 14.2-18.3 | 55.6-69.8 | 9 |
| Las Cruces/Los Manuels | 185-310 | 35.0 | 10.0 | 45.0 | 9 |
| Las Cruces/Los Manuels | 310-384 | 39.0 | 17.0 | 56.0 | 9 |
| Leona | 212-342 | 30.0 | 23.0 | 53.0 | 9 |
| Leona | 342-392 | 44.0 | 23.0 | 67.0 | 9 |
| Mara | 185-310 | 23.0 | 15.0 | 38.0 | 9 |
| Mara | 310-384 | 32.0 | 22.0 | 54.0 | 9 |
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| Merey | 342-392 | 71.0 | 15.0 | 86.0 | 9 |
| Oficina | ..... | 36.5 | 20.9 | 57.4 | 1 |
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| West Tara | 185-310 | 31.0 | 12.0 | 43.0 | 9 |
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| Average | | 41.5 | | 58.0 | |
| **Middle East:** | | | | | |
| Abqaiq, Saudi Arabia | ..... | 12.0 | 16.0 | 28.0 | 8 |
| Agha Jari, Iraq | 185-310 | 24.0 | 14.0 | 38.0 | 9 |
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| Kirkuk-Ain Zalah | 310-384 | 24.0 | 24.0 | 48.0 | 9 |
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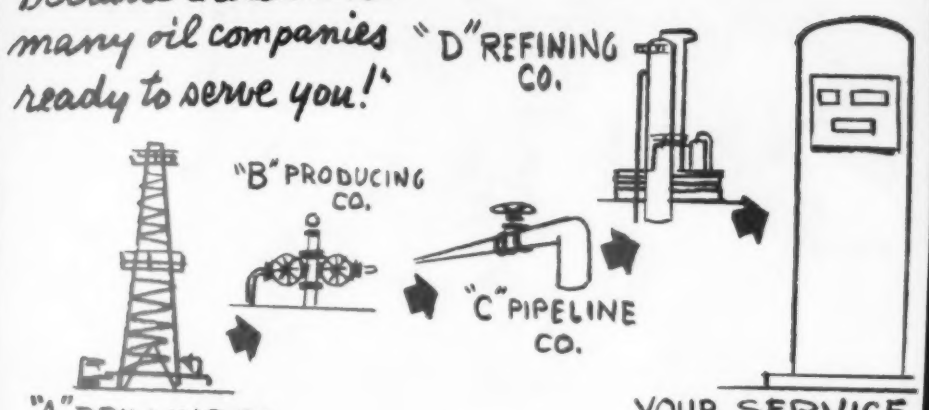

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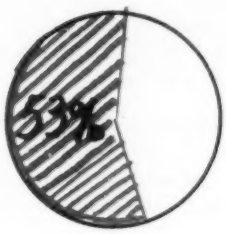


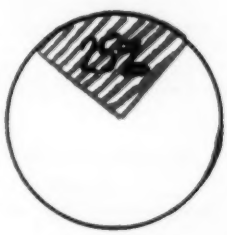


There are **5** auto manufacturing firms.

There are **82** steel producing firms.

There are **167** oil companies with refineries.

"Another logical way to measure competition is to see how much capacity or production is controlled by one company or small group of companies in any industry.

The facts:

No one oil company controlled more than 10% of the total oil processed at refineries last year.

And the three top oil companies controlled less than 25%. Compare that with the three biggest steel firms producing 53% of the steel, and the three major auto firms turning out 90% of the passenger cars.

There's certainly no concentration of control in the oil industry!

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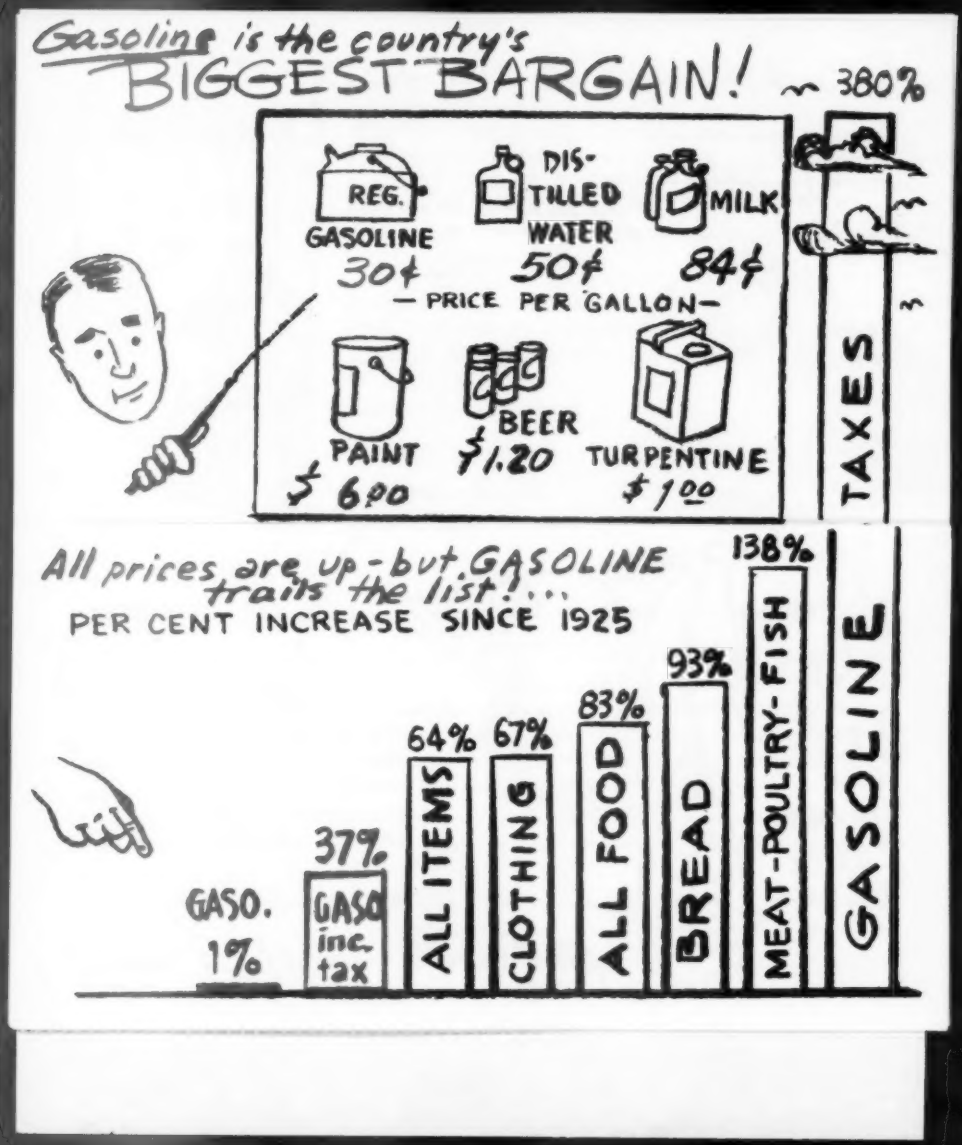
Gasoline is the country's
BIGGEST BARGAIN!
~ 380%
REG. GASOLINE
30¢
DIS-TILLED WATER
50¢
MILK
84¢
— PRICE PER GALLON —
PAINT
$ 6.00
BEER
$1.20
TURPENTINE
$1.00
TAXES
All prices are up - but GASOLINE trails the list! ...
PER CENT INCREASE SINCE 1925
GASO. 1%
37%
GASO inc. tax
64%
ALL ITEMS
67%
CLOTHING
83%
ALL FOOD
93%
BREAD
138%
MEAT-POULTRY-FISH
GASOLINE

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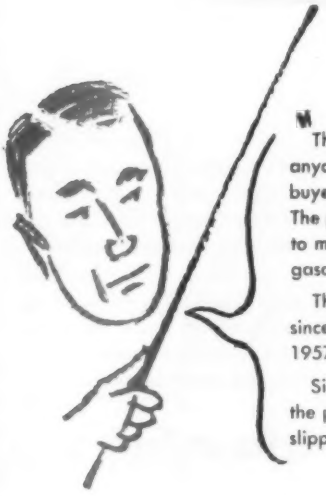
# How Prices are Set..

" Crude-oil buying is very much like an auction.

The buyers—corporation, individual, or refiner—set the price instead of the seller.

Because of competition among crude puchasers, the posted prices in one field are usually the same (but prices will vary from field to field due to quality differences.) "



"The reason is obvious. If one buyer offered to pay more than anyone else, he would be in a position to get all of the oil. So other buyers meet the highest price or go somewhere else to get their oil. The price offered is determined largely by its value to the refinery to meet current supply and demand of finished products—such as gasoline. So a buyer certainly won't offer too much.

There have only been two general increases in crude-oil prices since 1948. Both were 25-cent hikes, in June, 1953, and January, 1957.

Since crude is the raw material from which gasoline is made, the price of gasoline also went up. But now crude oil prices have slipped and gasoline has dropped too. "

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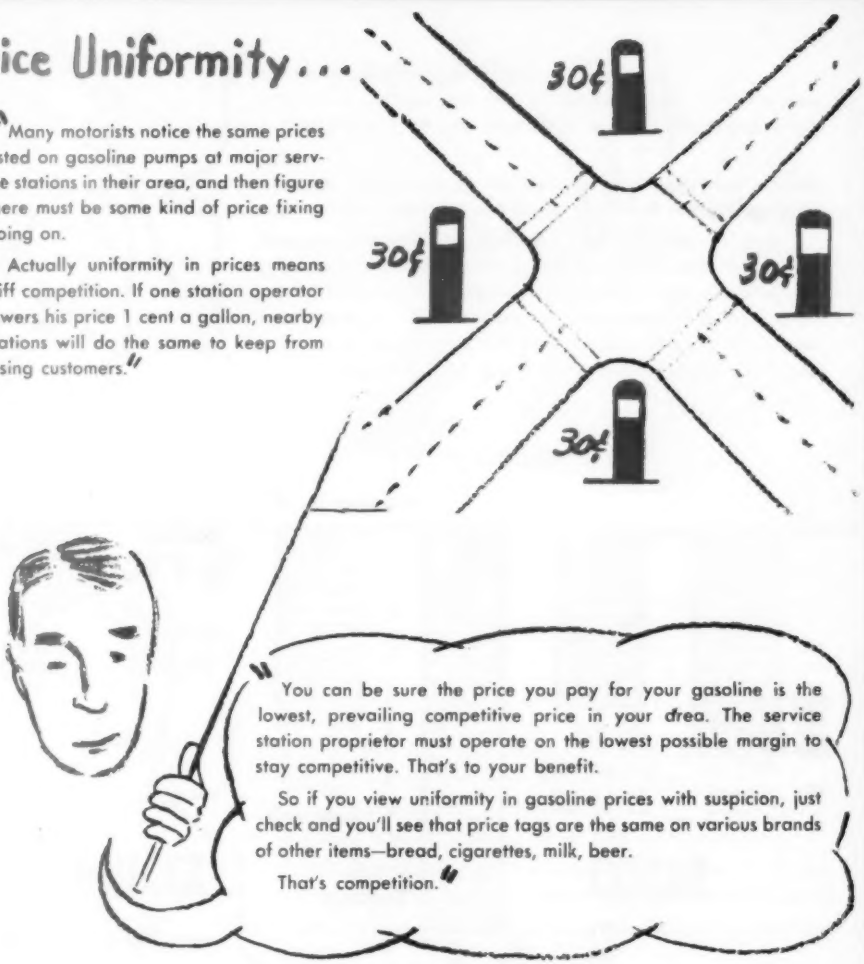
# Price Uniformity...

"Many motorists notice the same prices listed on gasoline pumps at major service stations in their area, and then figure there must be some kind of price fixing going on.

Actually uniformity in prices means stiff competition. If one station operator lowers his price 1 cent a gallon, nearby stations will do the same to keep from losing customers."




"You can be sure the price you pay for your gasoline is the lowest, prevailing competitive price in your area. The service station proprietor must operate on the lowest possible margin to stay competitive. That's to your benefit.

So if you view uniformity in gasoline prices with suspicion, just check and you'll see that price tags are the same on various brands of other items—bread, cigarettes, milk, beer.

That's competition."

**TABLE 2—NAPHTHENES (AND AROMATICS) IN FOREIGN CATALYTIC REFORMING FEED STOCKS**

| | Boiling range, ° F. | Weight per cent: Naphthenes | Aromatics | Naphthenes and aromatics | Reference |
|---|---|---|---|---|---|
| **Far East:** | | | | | |
| Seria, light | 185-310 | 54.0 | 18.0 | 72.0 | 9 |
| | 310-384 | 51.0 | 31.0 | 82.0 | 9 |
| **Venezuela:** | | | | | |
| Venezuela | ..... | 43.0 | 22.9 | 65.9 | 3 |
| Venezuela | ..... | 39.5 | 21.1 | 60.6 | 6 |
| Bachaquero | 212-342 | 67.0 | 6.0 | 73.0 | 9 |
| Bachaquero | gasoline | 68.0 | 7.0 | 75.0 | 9 |
| Lama | gasoline | 32.1-35.4 | 11.0-14.0 | 44.0-47.2 | 9 |
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| Leona | 212-342 | 30.0 | 23.0 | 53.0 | 9 |
| Leona | 342-392 | 44.0 | 23.0 | 67.0 | 9 |
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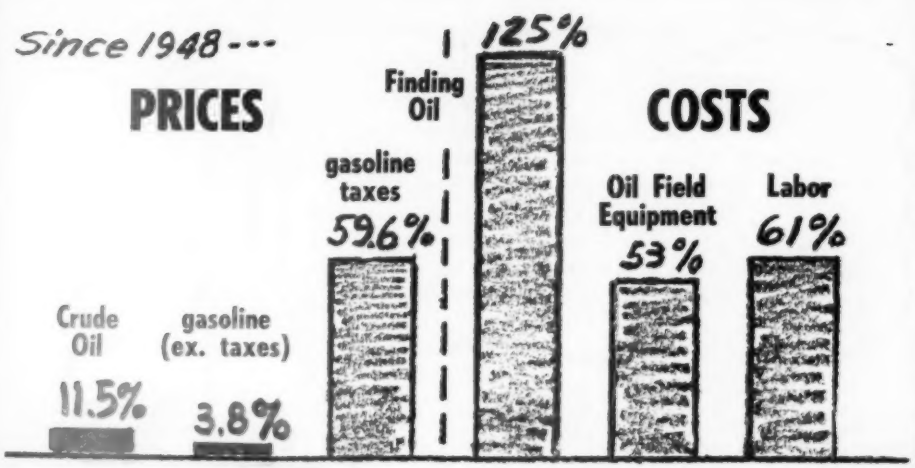

"Sure, prices of oil and gasoline have gone up in the last dozen years. But not nearly as much as spiraling costs.

Like other industries, oil companies have had to pay out more and more to operate each year as costs continue to soar.

But unlike other industries, oil companies—because of stiff competition—have had to absorb most of the higher costs themselves.

Other industries have passed along increased costs to you—their customer."

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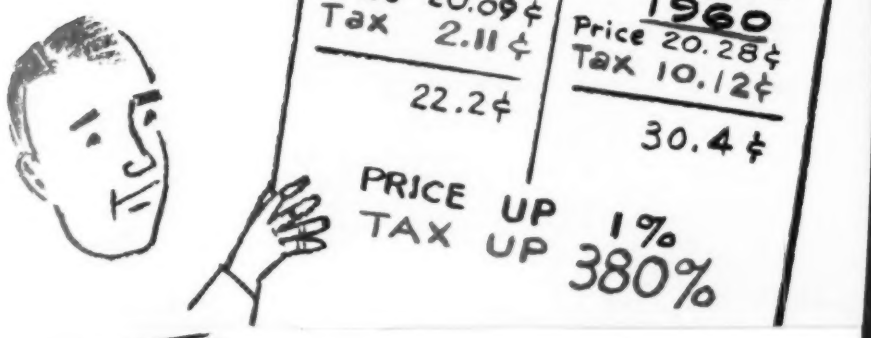


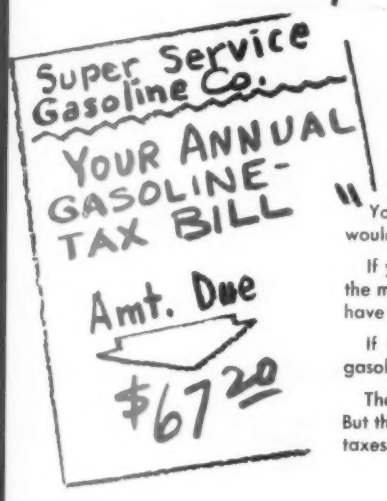


"You pay almost four times the rate of tax on gasoline as you would on a luxury item such as a fur coat.

If you think gasoline prices are high, just remember this: When the meter on the pump at your service station registers $1.50, you have spent $1 for gasoline and 50 cents for direct taxes.

If you're an average motorist, you will pay $67.20 in direct gasoline taxes this year.

The average posted price of gasoline is 20.70 cents a gallon. But the dealer has to collect an additional 10.12 cents a gallon in taxes, which go to state and federal governments."

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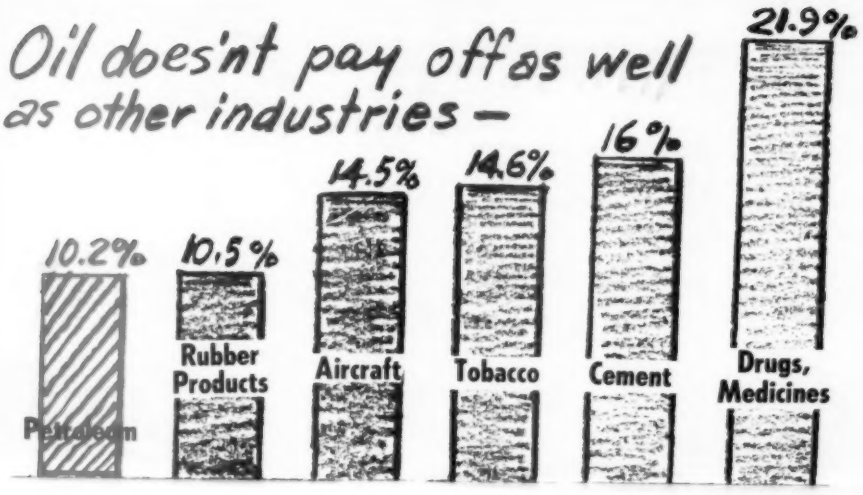
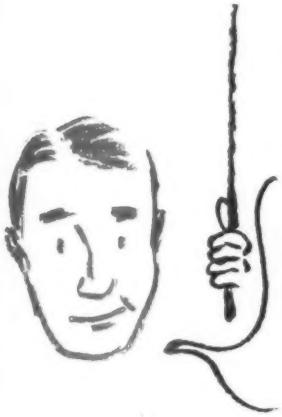
# Oil doesn't pay off as well as other industries —



"Many people think every oil man is a millionaire. They think of oil companies as high-profit outfits.

The truth is that oil-company profits generally are below those of manufacturing industry as a whole. And for every oil millionaire, there are hundreds of operators who have gone broke or made only a modest income.

Check the chart and see how oil compares with other industries in profits—the percentage of return on net assets."

**TABLE 2—NAPHTHENES (AND AROMATICS) IN FOREIGN CATALYTIC REFORMING FEED STOCKS**

| | Boiling range, ° F. | Weight per cent: Naphthenes | Aromatics | Naphthenes and aromatics | Reference |
|---|---|---|---|---|---|
| **Far East:** | | | | | |
| Seria, light | 185-310 | 54.0 | 18.0 | 72.0 | 9 |
| | 310-384 | 51.0 | 31.0 | 82.0 | 9 |
| **Venezuela:** | | | | | |
| Venezuela | | 43.0 | 22.9 | 65.9 | 3 |
| Venezuela | | 39.5 | 21.1 | 60.6 | 6 |
| Bachaquero | 212-342 | 67.0 | 6.0 | 73.0 | 9 |
| Bachaquero | gasoline | 68.0 | 7.0 | 75.0 | 9 |
| Lama | gasoline | 32.1-35.4 | 11.0-14.0 | 44.0-47.2 | 9 |
| Lama | gasoline | 41.4-51.5 | 14.2-18.3 | 55.6-69.8 | 9 |
| Las Cruces/Los Manuels | 185-310 | 35.0 | 10.0 | 45.0 | 9 |
| Las Cruces/Los Manuels | 310-384 | 39.0 | 17.0 | 56.0 | 9 |
| Leona | 212-342 | 30.0 | 23.0 | 53.0 | 9 |
| Leona | 342-392 | 44.0 | 23.0 | 67.0 | 9 |
| Mara | 185-310 | 23.0 | 15.0 | 38.0 | 9 |
| Mara | 310-384 | 32.0 | 22.0 | 54.0 | 9 |
| Merey | 212-342 | 45.0 | 13.0 | 57.0 | 9 |
| Merey | 342-392 | 71.0 | 15.0 | 86.0 | 9 |
| Oficina | | 36.5 | 20.9 | 57.4 | 1 |
| San Joaquin | 185-310 | 40.0 | 24.0 | 64.0 | 9 |
| San Joaquin | 310-384 | 38.0 | 34.0 | 72.0 | 9 |
| Tia Juana | | 46.0 | 10.0 | 56.0 | 8 |
| Tucupido | | 32.5 | 28.0 | 60.5 | 1 |
| West Tara | 185-310 | 31.0 | 12.0 | 43.0 | 9 |
| West Tara | 310-384 | 37.0 | 18.0 | 55.0 | 9 |
| Average | | 41.5 | | 58.0 | |
| **Middle East:** | | | | | |
| Abqaiq, Saudi Arabia | | 12.0 | 16.0 | 28.0 | 8 |
| Agha Jari, Iraq | 185-310 | 24.0 | 14.0 | 38.0 | 9 |
| Agha Jari, Iraq | 310-384 | 35.0 | 21.0 | 56.0 | 9 |
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| Kirkuk-Ain Zalah | 185-310 | 25.0 | 9.0 | 34.0 | 9 |
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| Qatar | 185-310 | 17.0 | 15.0 | 32.0 | 9 |
| Qatar | 310-384 | 16.0 | 27.0 | 43.0 | 9 |
| Kuwait | | 19.4 | 14.7 | 34.1 | 3 |
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An accurate measure of gasoline performance is "ton-miles per gallon."

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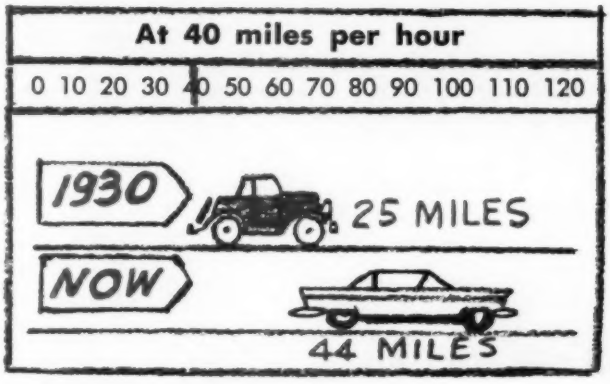
*"Of course you're driving more tons of car today."*



"Back in 1930, a gallon of gasoline could move a ton of the average car 25 miles at 40 m.p.h. Today, a gallon of gasoline will move a ton of automobile 44 miles at the same speed. That's a 70% increase, thanks to higher quality gasoline and high-compression engines.

It cost the average motorist about ⅗ of a cent a mile, not counting taxes, to move a ton of auto in 1930. Now it costs him only about ½ cent a mile.

So without such quality improvement, you would have to buy about 475 additional gallons of gasoline each year to drive the distance you do now. That would cost you an extra $140 a year."

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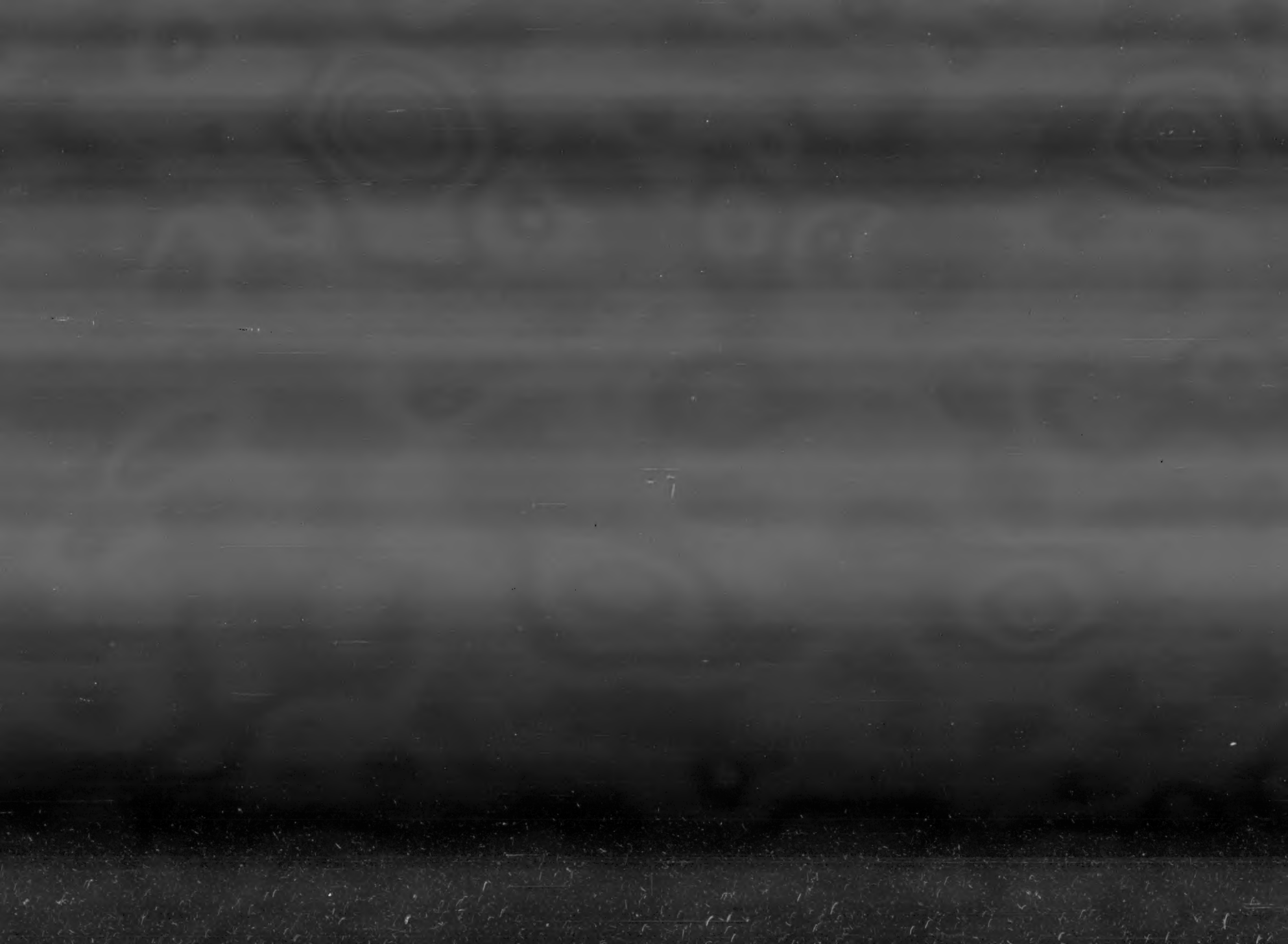

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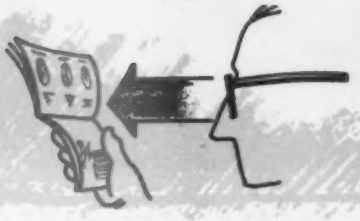

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Several drilling companies recently made on-the-job comparison tests. And J-M's rugged Wildcat outlasted all other packings tested!

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Wildcat's special design is the "secret" of its greater sealing efficiency. It not only improves the operation of your equipment . . . but it also results in longer life for both rod and packing. You get a tight, leakproof seal with less swell or bind . . . minimum friction . . . and highest resistance to abrasives and corrosives.

There are fewer interruptions for repacking. But when it's necessary, Wildcat's specially engineered design makes repacking so quick and easy that down-time is minimal.

Wildcat will surpass the performance and economy of any other packing you've ever used on your rig. See it at your field store, or write to Johns-Manville, Box 14, New York 16, N. Y. In Canada: Port Credit, Ontario.

JOHNS-MANVILLE JM PRODUCTS

# Aluminum pipeline for an aluminum plant

AN ABOVEGROUND aluminum natural-gas pipeline has been installed at the Baton Rouge, La., plant of Kaiser Aluminum & Chemical Corp., replacing a buried steel line which had become badly corroded.

Aboveground construction was dictated by the presence of several major plant streets, numerous buried pipelines, and the location of existing aboveground structures.

A 1,600-ft. line of seamless pipe ranging from 4 to 14-in. in diameter carries some 50 M.M.c.f.d. at 250 to 300 psig. The pipe through 10-in. is schedule 40 and the 12 and 14-in. has a wall thickness of 0.375 in. All pipe was extruded from aluminum alloy 6061-T6.

The contractor, H. E. Wiese, Inc., Baton Rouge, used both tungsten inert gas (TIG) and metal inert gas (MIG) welding methods. Welders were trained and qualified in both methods to take advantage of the greater speed of the MIG process in readily accessible locations and the easier handling of TIG equipment in close quarters.

To avoid galvanic corrosion where aluminum and steel met at flanged connections, insulating kits were installed. They consist of a gasket, sleeves for all bolts, and insulating washers at each end of the bolts.

The high-pressure section of the line was hydrostatically tested to 750 psig. for 2 hours.

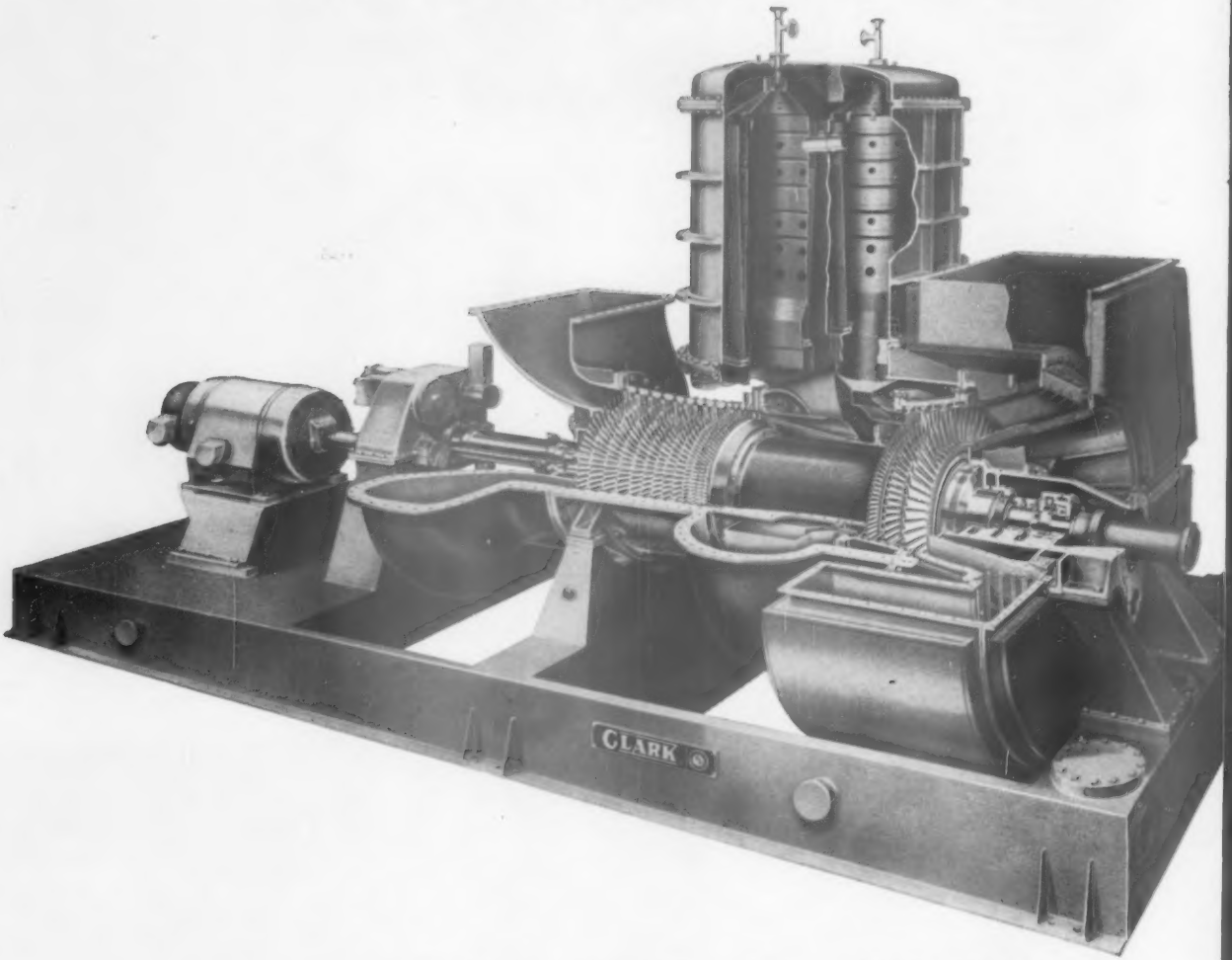
**Welding problems.** The major problem in welding was porosity in the weld. Leaking O-rings and a cracked porcelain cylinder in the MIG welding gun were allowing water to leak through into the gas envelope; as a result hydrogen was introduced into the weld.

Equipment repairs and slight modifications, such as changing the ½-in.-diameter metallic nozzle to ⅝-in. diameter, improved the flow of gas; a better envelope of argon was thus allowed to form around the arc and weld puddle. This contributed meas-

**ALUMINUM FITTINGS** are joined to 4-in. pipe by tungsten inert gas welding which was used in close quarters; metal inert gas welding was used in more accessible locations.

**DUAL METERING SYSTEM** shows tie-in of aluminum pipe (left) to steel pipe at insulated flange. Installation is at Kaiser Aluminum's Baton Rouge plant.

# No matter how you gauge PRIME MOVER COST...

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FIELD PROVED RELIABILITY—Important components such as compressor and turbine blading are based on proved designs which have operated for thousands of hours in Clark Dual-Shaft Gas Turbines. Turbine inlet temperature is held under 1400° F to ensure extra long life and to provide a substantial margin of operating safety. The turbine is completely air cooled and suitable for operation in arid country. Pressurized air is bled off the axial compressor to cool turbine blade roots and other high temperature components. In addition, cool air envelopes between inner and outer skin surfaces reduce heat loss and minimize heat radiation.

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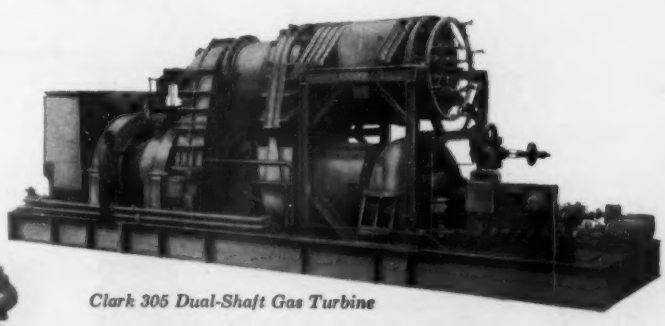
Your Clark representative will gladly give you all of the cost saving details on Clark Gas Turbines. Consult him or write us direct. CLARK BROS. CO., OLEAN, NEW YORK.

*Clark 305-S Single-Shaft Gas Turbine*



*Clark 305 Dual-Shaft Gas Turbine*

# BANTAM'S big-rig features do more . . . earn more

Here's the most modern crawler mounted crane-excavator ever built—the BANTAM C-350! For capacity, performance and profit-making versatility, BANTAM has all the big-rig features that you want: the fastest work cycles, widest work range, biggest choice of equipment.

The ideal high-production pipeliners' crawler rig, BANTAM C-350 has standard 2-speed, independent travel permitting you to lift, swing and travel all at the same time. On big or small jobs, BANTAM with back hoe digs over 100′ of 5′ trench per hour. Add the optional BANTAM long-boom back hoe, and you dig to 18′10″ without "digging in" first to get that extra depth.

## Crawler BANTAM goes everywhere!

BANTAM's low ground-bearing pressure (less than 3 lbs. per sq. inch with 32″ pads) and resulting high flotation let you go over *any* terrain without bogging down. And BANTAM's fast-acting, easy-operating mechanical controls are never affected by freezing, heat or moisture—completely maintenance-free.

BANTAM's advanced, rugged design outdates all others and assures you of years of trouble-free service on all kinds of jobs. It's travel-ready at all times—with no disassembly or special permits needed. You save time coming and going, as well as on the job.

## Work and earn with 11 BANTAM-built attachments

BANTAM handles all your excavating and lifting chores, working with 11 fast-change attachments. In addition, more than 25 optional features let you equip your BANTAM to match your specific needs.

◀ Another popular BANTAM for pipeline operations—the carrier mounted BANTAM T-350. Husky 11-ton lifting capacity and easy, permit-free mobility make this BANTAM the mobile work leader of its size. Works and earns with all BANTAM-built attachments. Check the self-propelled BANTAM CR-350, too—one-man, one-engine operation. 4 x 4 drive optional.

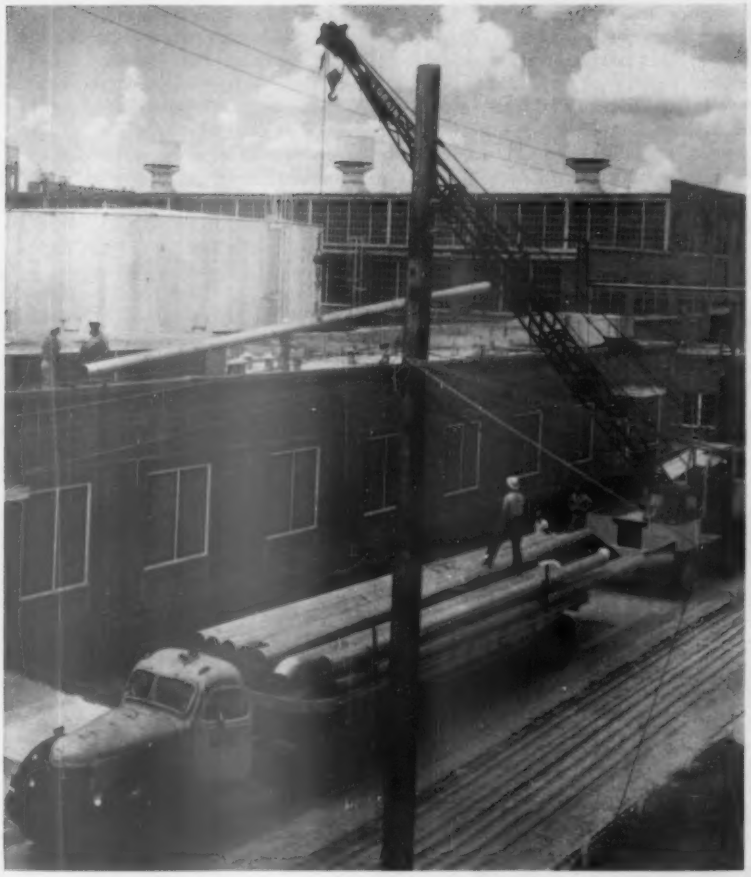
**Get the facts** that prove BANTAM's superiority in speed and savings over any other rig in its class. Write for complete details today!

PC-287

SCHIELD Bantam Co.

243 Park Street, Waverly, Iowa

WORLD'S LARGEST PRODUCER OF TRUCK CRANE-EXCAVATORS



**FORTY-FOOT SECTIONS** of 10-in. are being placed on supports atop this research-laboratory building. The light aluminum pipe's ease of handling simplified aboveground construction in the congested plant area.

urably toward reduction of porosity.

During shop fabrication the welders developed a method of application which virtually eliminated porosity: All joints were cleaned before welding and between passes with a stainless-steel brush; the MIG gun nozzle was scraped clean of weld spatter; all starts and stops were chipped or ground to a taper before starting the next weld; the filler wire was cut about ¼ to ½ in. from the gun nozzle before starting a weld. In both shop and field fabrication, proper shielding of the weld area from vagrant air currents was of prime importance.

## Cut costs and contamination with nonlubricated compressors

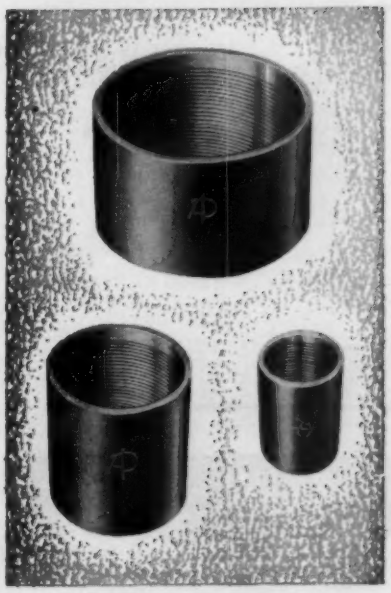
MICARTA RINGS and packing impregnated with molybdenum disulfide have been used by Arkansas Louisiana Gas Co. in its compressor-cylinder operation for several years with exceedingly good results.

On these cylinders, we have been able to eliminate liquid-oil lubricants normally applied by pump lubricators and to rely upon the lubricating properties of molybdenum disulfide (moly).

Adapted from a paper presented at the 1960 AGA Operating Section Conference, New Orleans.

Lubricated compressor cylinders have numerous disadvantages such as oil contamination of downstream dehydrator beds and of pipelines with a resulting loss of efficiency. There is also the cost of lubricators, their operation, and maintenance, and of course, the lubricating oil.

**Test period.** The company first tried liquid moly in compressor lubricators for break-in about 4 years ago. The packing ran much cooler than normal. After this, one cylinder of a field

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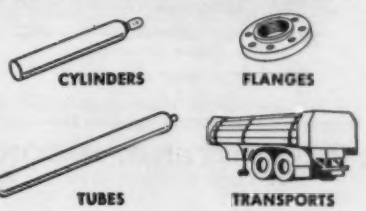

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compressor was equipped with moly micarta rings and packing. During break-in, the lubricator pumps were operated for several hours, then the oil was cut off. Later inspection showed less wear on the moly-equipped cylinder than on adjacent lubricated cylinders.

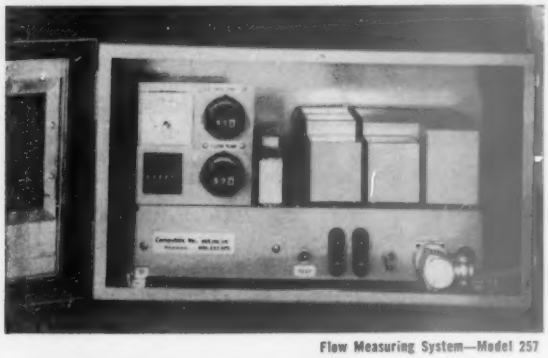
Moly micarta rings and packing were then tried on mainline compressors with excellent results. All new compressors purchased over the past 3 years have been moly micarta equipped and are operated nonlubricated. To date we have over 100 nonlubricated cylinders in operation.

There have been three liner failures, of which two were caused by the cylinders receiving highly abrasive aluminum-oxide dust from downstream of a dry-type dehydrator. A dust filter was installed, eliminating this problem. The other liner failure was on a compressor with a glass fiber dust filter. Excessive oil from the pipeline carried fine oxide dust through this filter to the compressor. Since this failure, the oil and dirt carryover has diminished and no further trouble has resulted.

**Operating experience.** Moly micarta packing rings have not in all cases given as good service as experienced with moly compressor piston rings. In some cases there has been more blow-by than with lubricated packing; in several instances the packing failed sooner than adjacent lubricated packing. However, the operation of moly packing has generally been good. One packing case is now being tried with a combination of moly-coated cast-iron rings and moly micarta rings, with good results to date.

Cylinder liner and ring wear have been greatly reduced with nonlubricated cylinders. At one station cylinder wear with lubrication averaged 0.003 in. of wear in the first 10,000 hours' operation as compared to 0.0005 in. of wear with moly micarta rings and no lubrication. A new field compressor compressing a combination of oil and gas-well gas had 0.0015 in. of wear in the first 8,000 hours.

Most new nonlubricated rings and packing have been put into operation with lubrication for the first few hours. However, four new 660-hp. units, each having four compressor cylinders, were put into operation without hooking up the lubricators and oil lines, thereby receiving no break-in lubrication. Normal operation followed these break-ins and typical nonlubrication wear rates have been experienced. One two-cycle 27-in. scavenger piston was equipped with a moly micarta ring 2 years ago and has been operating since without oil.



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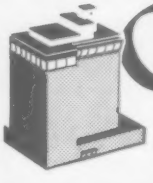

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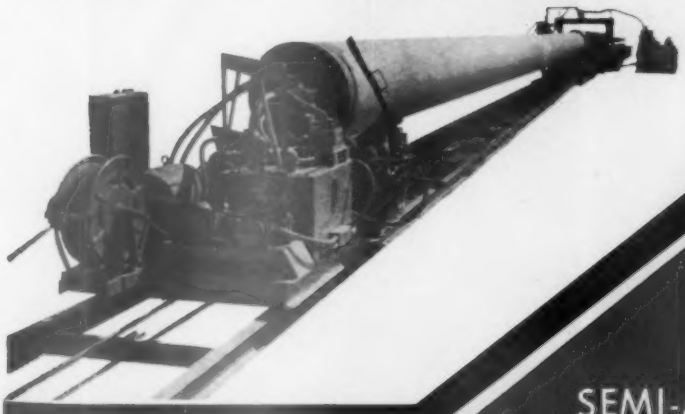

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# Exclusive LUFKIN Chrome Clad® lines defy grit, grease, gravel—and rugged use!

**Here are** "he-man tapes" that work like troopers when the job's toughest!

**Easy-to-read** markings will *stay* easy to read, because they're bonded to steel, electroplated and chrome coated. Lines won't kink or break. Sturdy metal construction (except for carrying handle). It all adds up to two-fisted quality that *lasts!*

**Exclusive** quality features are yours in *all* Lufkin tapes. For example:

**Lufkin Chrome Clad® DERRICK Tape** (above, left) gives you instant readings on a line that won't rust, chip or peel. An extra-sturdy line, ¼" wide, with hook and ring. Lock-handle frame. Turn handle over, lock line at any point. Available in 100-200' lengths.

**Lufkin "ATLAS" Gaging Tape** (above, right) gives you easier reading, too, with durable, jet-black markings on glare-free line. Line is 50% heavier than standard. Has 20-ounce plumb bob, and sturdy lock-handle frame.

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▶ ▶ ▶ New Equipment Section

# This week's SHOWCASE features . . .

## Motor-generator combination

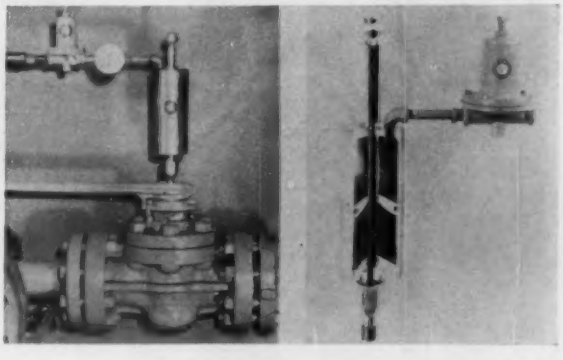
. . . just developed is designed to provide a continuous source of 60-cycle, a.c. power. Operating at 1,760 r.p.m., the unit develops 10 kva. If the power line serving the unit fails, the generator is driven by a gasoline or diesel engine which is automatically brought up to speed so that the frequency dip will not exceed approximately five or six cycles.

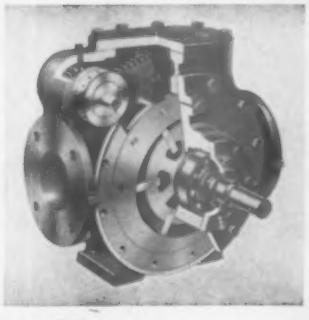
To minimize frequency and voltage dip when normal power fails, the motor-generator is carried by the momentum of a massive flywheel. The motor that drives the generator may be either a single or three-phase low-slip induction type. A magnetic amplifier mounted on the collector-ring or the generator end regulates the generator. The motor-generator combination weighs 698 lb. and measures 3 ft. 11 in. long, 17 in. wide, and 18 in. high. Source: **Kato Engineering Co., Mankato, Minn.**

## Automatic valve lubricator

. . . designed to provide lubricated plug valves with a continuous and regulated supply of lubricant has just been introduced. The lubricator is particularly applicable for remote valve installations where controlled and automatic lubrication is necessary. Since the lubricator is adjustable, it can be set to furnish lubricant only when the valve requires it.

The complete assembly is 2⅝ in. in diameter, 13½ in. long, and has a working capacity of 1.6 cu. in. In general, its use is intended for valve sizes not over 6 in. Source: **Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh 8.**





## Variable-capacity rotary pump

. . . called the Vari-Flo makes it possible to dial instantly any desired flow rate from zero to full capacity without changing pump speed, the maker claims. According to the maker, the pump can be powered with any standard-speed motor and provides the advantages of more-complicated and expensive variable-speed drives usually needed. The pump flow direction can be reversed while the pump operates by turning the dial. This permits evacuation of discharge lines without additional bypass piping and valves.

The pump comes in three basic sizes, 2, 3, and 4 in., with capacities to 450 g.p.m. Source: **Blackmer Pump Co., 1809 Century Ave., S. W., Grand Rapids 9, Mich.**

## Latest pipelayer

. . . is capable of 12,270 lb. greater lifting capacity than its predecessor, the maker reports. The No. 561 Series

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# Recorders of the future will have

Powerful Servomatic Motors in both TRANSCOPE® Pneumatic and Electronic Recorders give unprecedented accuracy of records . . .

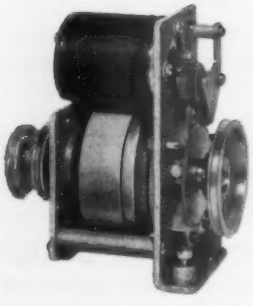
One of the reasons why the 90J (pneumatic) and 700J (electronic) recorders have become the most wanted miniature instruments is this exclusive Taylor feature . . . powerful Servomatic motors that give more precise pen positioning than ever before. Check these benefits:

- Threshold sensitivity of 0.1% to input signal.
- 150 times more power than bellows type used in conventional pneumatic recorders. Over 1,000 times the output power of galvanometer systems in electronic instruments.
- Unprecedented standards of accuracy—½ of 1% in standard instruments—¼ of 1% optional.
- 3 months' ink supply *mounted on the pen*—no capillary.
- Integral heavy duty process alarms in recorder cases . . . 2 per servo . . . up to 6 per recorder.
- No flimsy linkages and levers.
- Truly rectilinear chart—no curved time lines.

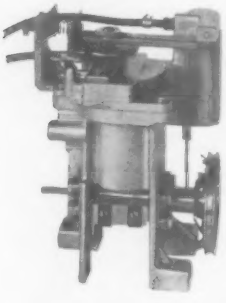
Servomatic motors also allow these optional features: alarm contacts; retransmitting potentiometer; function generation; digital output with encoder discs.

**"Hunk of Brass" Test.** Ask your Taylor Field Engineer to show you the 'Hunk of Brass' test — conclusive proof of the power of Servomatic motors to assure positive, precise positioning of the pen.

For full details of TRANSCOPE servo operated recorders and their many superior features, write for **Bulletin 98335** (electronic) or **Bulletin 98286** (pneumatic). Taylor Instrument Companies, Rochester, New York, and Toronto, Ontario.



**700J (electronic) servo motor** is 2 phase, size 15, 60 cycle, 117 volt—built to military specifications. Precision gearing couples the servo to a precise feed-back device with high torque.



**90J (pneumatic) servo motor** is essentially a power piston with a built-in positioner. Solid construction assures long, trouble-free life.

*Taylor Instruments*

# Servo Power

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ELECTRONIC
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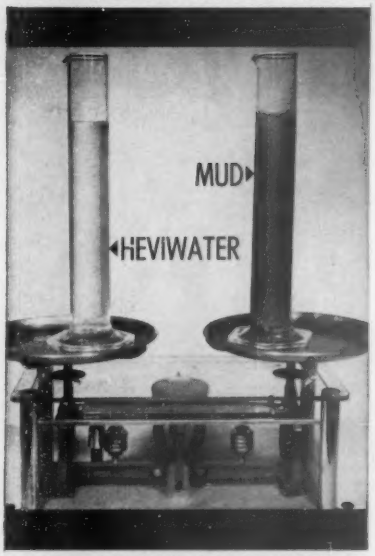


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Now — for the first time — you can have all the advantages of a clear, heavy completion fluid without the troubles previously associated with this type of material. A new fluid is now available from Dowell. It's Heviwater*—a pre-mixed, inhibited packer and completion fluid. Heviwater is available in a variety of weights. It is a stable fluid, with built-in corrosion protection. Heviwater is presently stocked at Berwick, Louisiana, but it can be made available at all Dowell stations. Ask your Dowell man for more information on this brand-new, completion fluid; or write Dowell, Tulsa 1, Oklahoma.

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B machine will replace the maker's MD6 pipelayer.

Maximum lift capacity of the No. 561 machine is 38,800 lb. at 4-ft. overhang with 5,000 lb. adjustable counterweights. The machine is powered by a compact engine that delivers 95 flywheel hp. Source: **Caterpillar Tractor Co., Peoria, Ill.**

●

## Pump capacity

. . . upped to 3,000 g.p.m. with the recent addition of two new sizes to the line of Goulds vertical centrifugal sump and process pumps. The sizes—6 and 8-in. discharge units—are available for pit depths from 3 to 20 ft. for either dry or wet-pit service. They come in iron, bronze fitted, or stainless-steel construction.

An open impeller on the units has ejector vanes on the back side which, he maker claims, prevent entrance and jamming of solid materials between the back of the impeller and the stationary side plate. Six-in. pumps will handle solids with diameters up to 1 11/32 in.; 8-in. pumps up to 2 27/32 in.

For vaporproof handling of toxic or hazardous liquids, all points of leakage of vapor or fumes are sealed and an upper stuffing box is supplied

which also has a water jacket for cooling. With stuffing box and quench gland cooling, liquids with temperatures up to 350° F. can be handled. Source: **Goulds Pumps, Inc., 205 Black Brook Rd., Seneca Falls, N. Y.**

●

## Fuel-oil stabilizer

. . . called Polyflo 120 promises to provide effective stabilization of fuel


Patent No. 2,843,373

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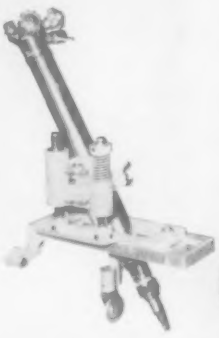

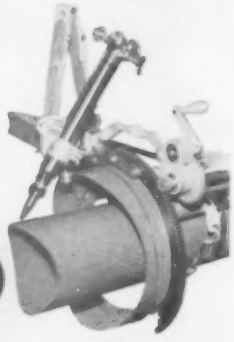

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Features a free-wheeling roller assembly that swivels a full 360° — rides the pipe surface and is controlled by a unique spring tension that makes corrections for any eccentricities — eliminates inaccurate cuts and bevels.

**H&M SHAPE CUTTER for intersectional cutting**
Cut saddles and miters for the fabrication of tees, els and other irregular designs simply, easily with the H&M Shape Cutter. The machine uses pattern templets to insure accurate cutting and produce precision design work.

**The Shape Cutter and Out-of-Round are available in a full range of sizes to fit all H&M Pipe Cutting and Beveling Machines. Write for catalog sheets on the complete H&M line, Today!**

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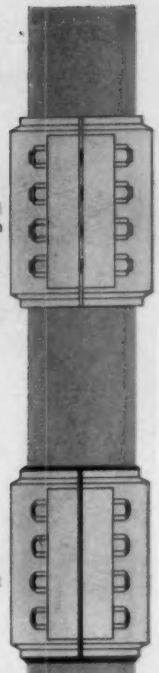


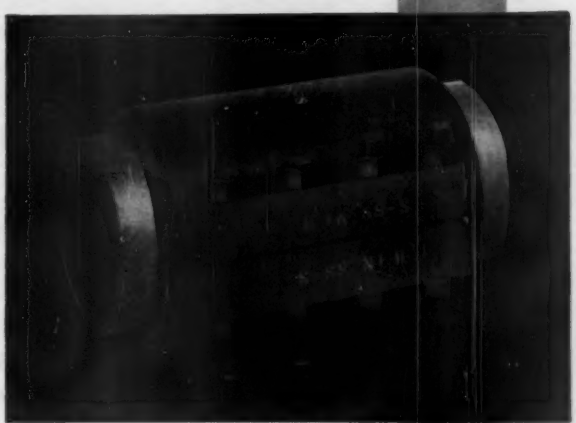

The Smith Split-Coupling can be used as coupling, repair clamp or split sleeve.
Easy installation—Place halves around pipe. Tighten side bolts.
**Permits welding while pumping.**
Available in standard pipe sizes.
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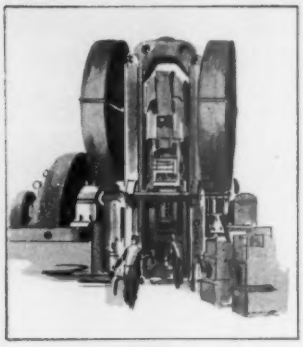

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**CARBON AND ALLOY SEAMLESS STEEL TUBES**

**OF INHERENT, SUPERIOR QUALITY**

**1** **SMOOTH INSIDE SURFACE**
Round Billet is Pierced Around Precision-Ground Sliding Mandrel *Versus* Stationary Plug Piercing.

**2** **ACCURATE CONCENTRICITY**
Mechanically Guided Piercer *Versus* Floating Plug Piercer.

**3** **UNIFORM WALL THICKNESS**
Three Roll Size Reduction *Versus* Two Roll Reduction.
50% More Roll Pressure Points
50% Less Chance of Variation

**4** **IMPROVED PHYSICALS**
Instantaneous Extrusion Impact *Versus* Prolonged Spiral Rolling.
Approximately Equal Transverse and Longitudinal Properties, resulting: Higher Tube Hoop Strength.

**5** **FAST PIERCING AND REDUCTION OF HARDEST STEELS**
Extrusion Speed Rates up to 25 Feet per Second *Versus* Tedious Plug and Roll Piercing.

Elapsed Time from Billet to Hot Finished Tube, 33 Seconds *Versus* Reheating and Reduction.

**SIZES UP TO 3½" O.D.**

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K seamless S
QUALITY TUBES

oil at lower cost, according to the maker. It is reportedly especially suitable for treatment of No. 2 heating oil and diesel fuel derived from a wide range of crude stocks and can be applied to other distillates. Specific application depends upon the type of crude and the processing, storage, and transportation methods involved. Source: **Universal Oil Products Co., 30 Algonquin Rd., Des Plaines, Ill.**

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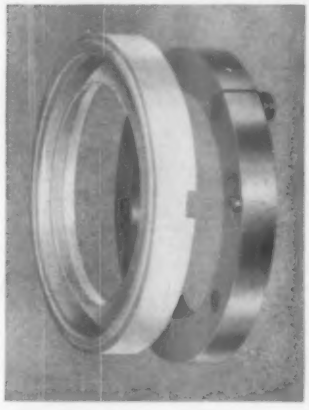

## Mechanical seals

... protection is offered by this product, called a Dura Lip seal. Its purpose is to provide a controlled amount of liquid injection into the stuffing box to prevent abrasives in process fluids from reaching the mechanical seal. It is composed of two parts, a split expansion collar, and a floating teflon lipsealing ring. The seal is installed in the bottom of the stuffing box bore. The split collar is expanded firmly against the stuffing box bore. Source: **Durametallic Corp., 2104 Factory, Kalamazoo, Mich.**

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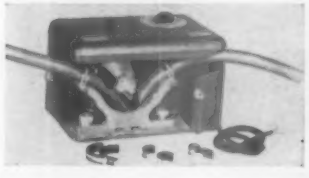
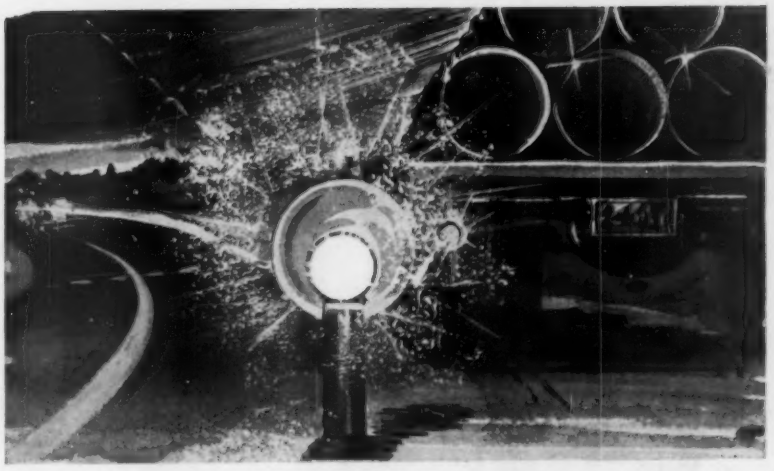


## Flow-induction pump

... uses a flexible hose on a multicurved track to move liquids, slurries, emulsions, or gases without contact between the materials and metal pump parts. The materials pass entirely through the hose portion of the pump. Capacity of the H. R. flow inducer is variable from a few cubic centimeters to nearly 80 g.p.m. Source: **Schueler & Co., 75 Cliff, New York 38.**

**EMERGENCY orders are STANDARD OPERATING PROCEDURE at Leland**

Every day . . . and many a night . . . Leland's Parts and Service Department handles emergency orders from customers in the field. Leland personnel know that equipment breakdowns can throw a customer's operations into the red . . . FAST . . . and that's why the entire Leland organization specializes in expediting parts shipments and service orders.

The next time a breakdown stops your equipment . . . call Leland for the FAST ACTION needed to keep your operations in the black.

**Leland truck bodies can make your trucking operations more profitable . . . put you further into the black. Ask for information on Leland's "Packaged Unit" Bodies . . . Fifth Wheel Bodies . . . Single Axle and Tandem Pole Trailers . . . Single Axle and Tandem Self-Loading Floats. . . . Tandem Axle Lowboy Trailers.**

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Tulsa Winch
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CLEVELAND TRENCHERS

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HOES

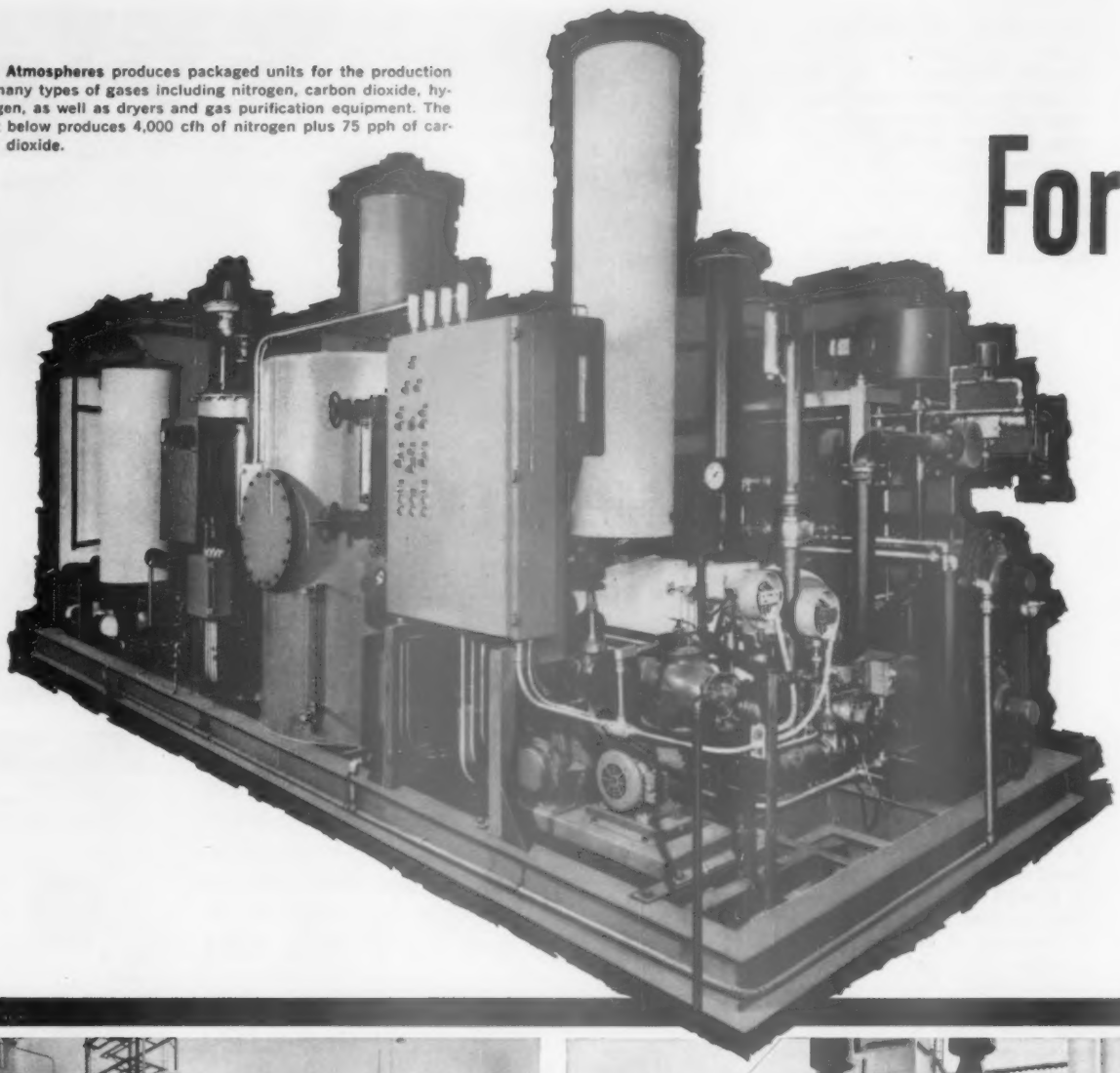
AIR TOOLS ROCK DRILLS
COMPRESSORS

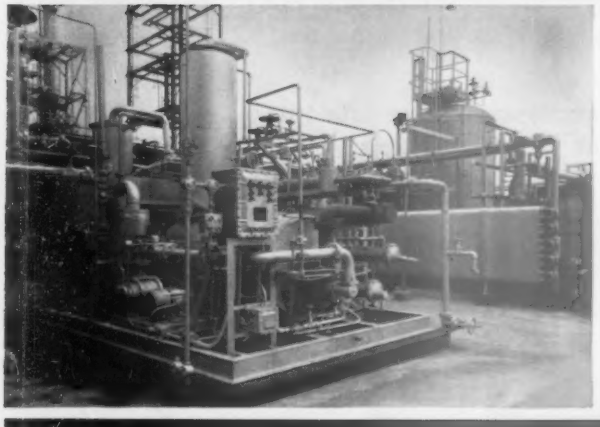
35th ANNIVERSARY 1925-60

Leland
EQUIPMENT COMPANY
Oklahoma City • TULSA • Longview, Texas

**Gas Atmospheres** produces packaged units for the production of many types of gases including nitrogen, carbon dioxide, hydrogen, as well as dryers and gas purification equipment. The unit below produces 4,000 cfh of nitrogen plus 75 pph of carbon dioxide.

# For





**Texaco, Inc.** uses this 10,000 cfh nitrogen/carbon dioxide Gas Atmospheres generator in the production of oil additives. A new 20,000 cfh unit was recently delivered.

**Esso Standard Oil** has several Gas Atmospheres inert generators to supply gas for blanketing storage areas. This 10,000 cfh unit is at their Baton Rouge refinery.

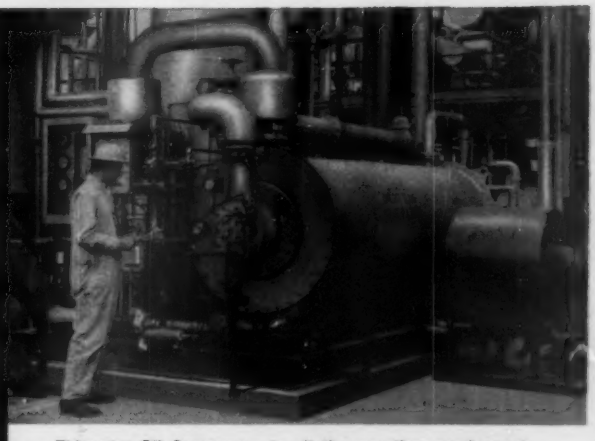
# Petroleum Processors!

## *Gas Atmospheres engineers industry's most complete line of "Packaged" Gas Generators*

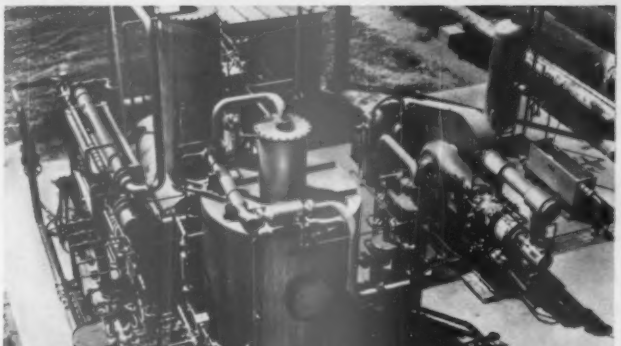
Originators and leading producers of packaged gas generation systems, Gas Atmospheres now offers petroleum processors and refiners the most complete line of compact atmosphere gas generators available.

The demand for more refined fuels and safer processing practices has interested the industry in producing their own gases to get greater volume at reduced costs. Gas Atmospheres engineers have worked with many leading petroleum processors and refiners to engineer and provide the most exacting and efficient factory tested, packaged atmosphere systems possible.

If controlled atmospheres are part of your future —why not deal with the leaders—call in our representative soon. Contact *Gas Atmospheres, Inc., 3855 West 150th Street, Cleveland 11, Ohio.*



**Tidewater Oil Company** gets all the gas they need, most economically, by producing their own in this 70,000 cfh packaged Gas Atmospheres inert generator.



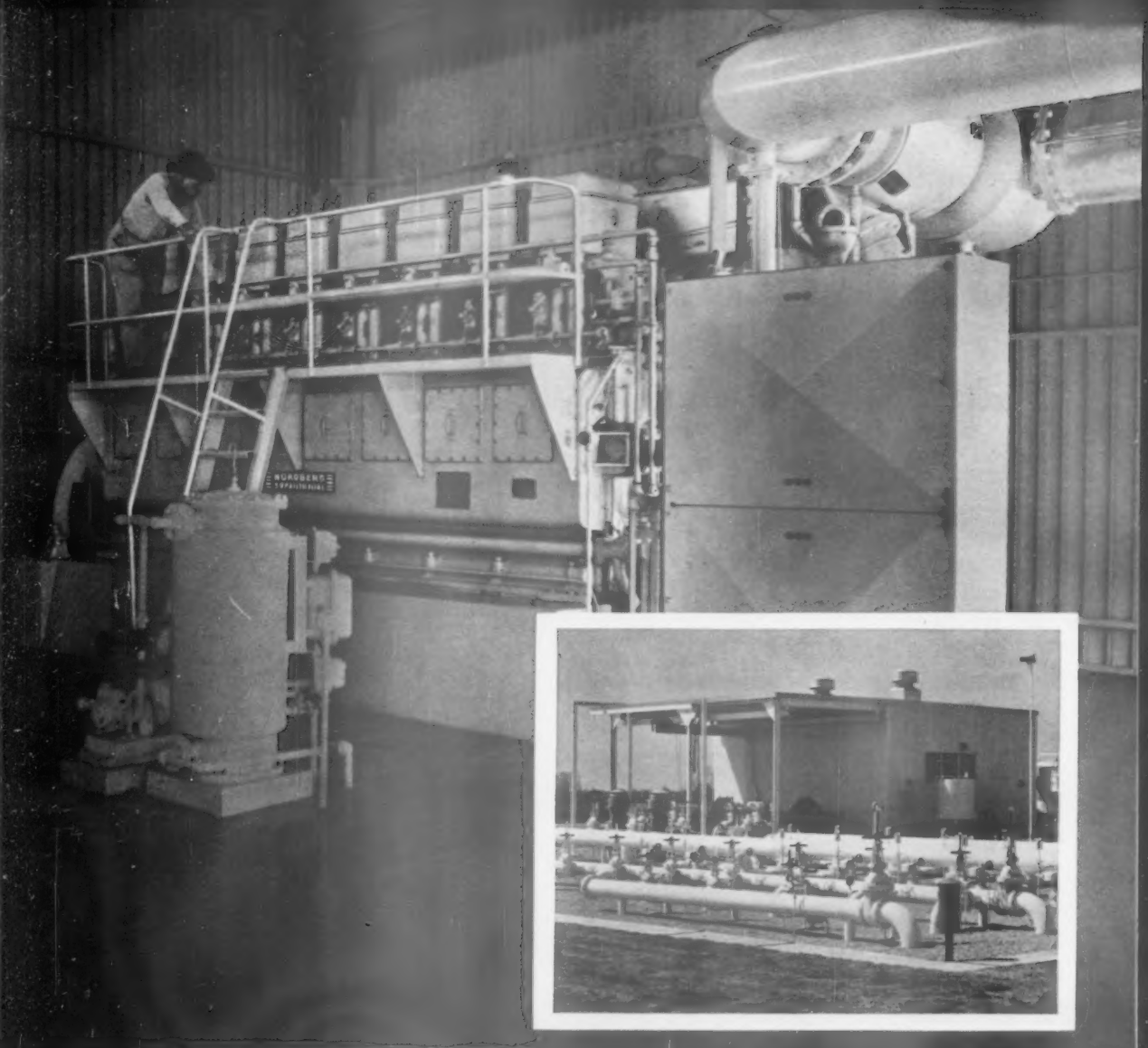
**Humble Oil Company** uses this 10,000 cfh Gas Atmospheres nitrogen generator to produce gas for purging lines and blanketing storage.

**YOU GET UNSURPASSED EXPERIENCE, TOO, WHEN YOU CALL GAS ATMOSPHERES**

*Partial List of Gas Atmospheres Petroleum Processing and Refining Customers*

| | |
|---|---|
| Compagnia Termica (Italy) | Shell Oil Company |
| Esso Standard Oil Co. | Standard Oil of California |
| Ethyl Corporation | Standard Oil of Indiana |
| Humble Oil & Refining Co. | Standard Oil of New Jersey |
| Kendall Refining Co. | Standard Oil of Ohio |
| Lubrizol, Inc. | Standard Vacuum Oil Co. (So. Africa) |
| Mobil Oil Co. | Texaco, Inc. |
| Nynas Petroleum (Sweden) | Tidewater Oil Co. |

**gas Atmospheres, inc**
**equipment for producing industrial gases**



# Pipe line engines by Nordberg

One of two Nordberg 2000 hp dual fuel engines powering main line pumps at the Teague, Texas station of Sinclair Pipe Line Co. All mechanical equipment is lease-rented from Nordberg. Note that building houses only the engines. Pumps, gears, and most auxiliaries are outside.

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NORDBERG MANUFACTURING COMPANY
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ATLANTA • CLEVELAND • DALLAS • DULUTH • HOUSTON • KANSAS CITY • MINNEAPOLIS
NEW ORLEANS • NEW YORK • ST. LOUIS • SAN FRANCISCO • TAMPA
WASHINGTON • TORONTO • VANCOUVER • JOHANNESBURG • LONDON • MEXICO D. F.

## Trencher for pipeline jobs

. . . across the country is the recently announced 420 Trenchliner. With a 12-ft. 8-in.-diameter wheel, it can cut a trench up to 7½ ft. deep and 48 in. wide, or 52 in. wide with optional side cutters.

The wheel has three speeds—113, 214, and 295 f.p.m., and optional sprockets give a 15% increase or decrease. A reversible conveyor with a 36-in.-wide belt also has three speeds—193, 378, and 621 f.p.m. The machine has 21 digging speeds, ranging from 15.1 in. to 25 f.p.m. Source: **Parsons Co., Box 431, Newton, Iowa.**

## Magnet lifts 3,000 lb.

. . . the maker reports. Called the Ton-Toter, the lifting device requires no power line, batteries, or accessory equipment, the maker says. It is a completely self-contained unit. Ceramic magnets in a steel assembly are used to power the magnet. Source: **Bux Magnetic Products, Inc., 1355 N. 10th St., San Jose 12, Calif.**

## Valve operates easily

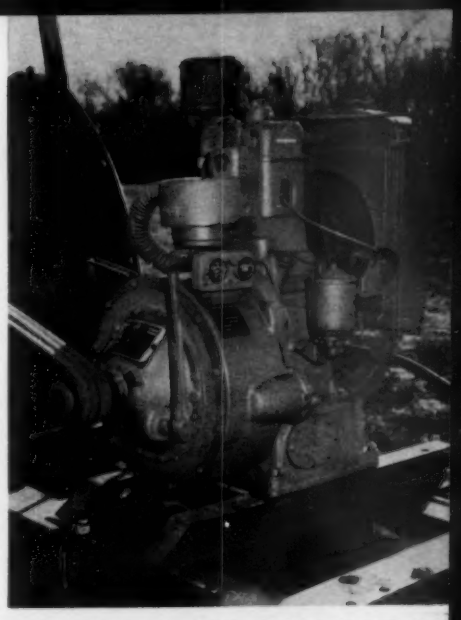
. . . even if closed while hot and then permitted to cool, the maker claims. This is achieved by the use of a flexible wedge disk. As the body seats of the Flex Gate gate valve pinch the disk, the disk flexes slightly to conform to the new seating position.

The steel valve comes in ratings of 150 and 300 lb. ASA. It is expected to prove particularly valuable in refinery service. Source: **Crane Co., 836 S. Michigan Ave., Chicago 5.**

•

## Faster trap installation

. . . may be obtained with a new unit called a Type TSV Piping King, and installation costs may be reduced. The unit consists of a forged-steel steam

Power Chief® Oil Field Engines for production pumping

Actual on-the-job operating figures have proved that Power Chief gas engines consistently establish records of reliability and low maintenance. Records show over 43,000 hours of continuous pumping operation with original rings, pistons, liners, valves, bearings and crankshafts still in place.

Built in 1, 2 and 3-cylinder models, these rugged medium-speed units are ideal for production pumping and water flooding service in sizes up to 54 hp, max.

NORDBERG MANUFACTURING COMPANY

Milwaukee 1, Wisconsin

©1960 N.M.CO. PC480

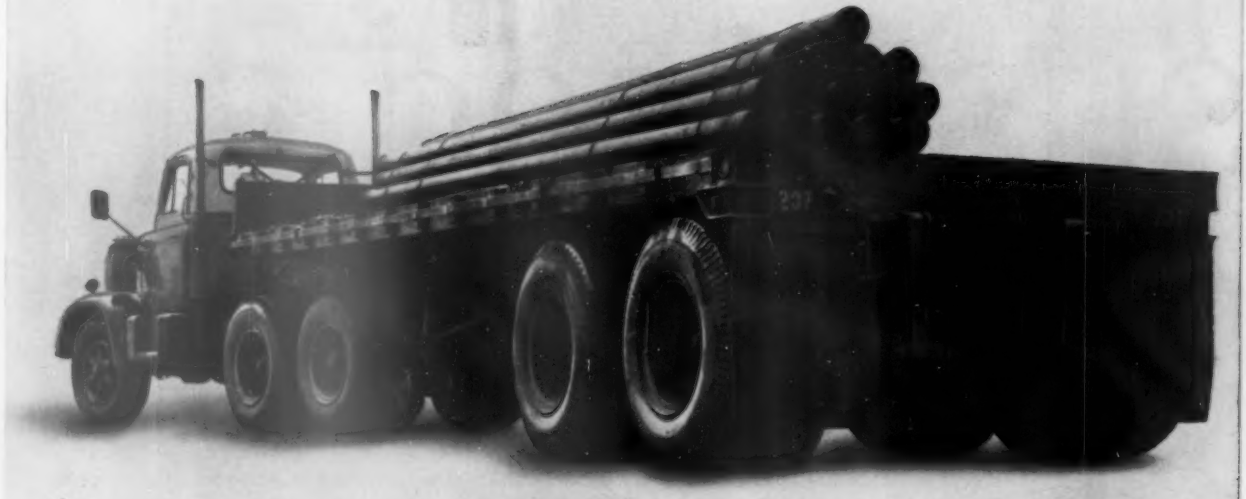
# Invest $171

Investing $171 for a barrel of Duomeen® CD-50 is obviously less costly than shelling out $1700 for a load of new pipe. Yet every year oil producers are paying out millions of dollars to replace pipe that failed, due to the corrosive environments in water systems. By using Duomeen CD-50, a combination corrosion inhibitor and bactericide, much of this needless expense can be avoided.

Extensive field tests have established sulfate-reducing bacteria to be one of the more important factors in causing corrosion. Thorough investigations have also proven the effectiveness of Duomeen CD-50 in preventing the harmful effects of these bacteria.

Additional savings result with the use of Duomeen CD-50 because many costly remedial measures are eliminated. Savings are effected by the prevention of

# Save $1700



bacteria and bacterial by-product plugging, less down-time, and lower power costs to maintain injection pressures.

For complete detailed information on Armour's bactericides—corrosion inhibitors and other chemicals for oil production, write for the booklet, "Armour Organics for Increased Oil Production." Samples of Duomeen CD-50 and other Armour oil production chemicals for your own testing are also available.

**Armour Industrial Chemical Company**
*©Division of Armour and Company*
*110 North Wacker Drive • Chicago 6, Illinois*

# accuracy

**ASHCROFT DURAGAUGES** measure pressure with precise accuracy no matter how severe the conditions of service

*Ashcroft Duragauges are available in pressure ranges from 15 psi (or vacuum) minimum to 100,000 psi. Dial sizes: 4½" through 12".*

# sustained

The Bourdon tube in Ashcroft Duragauges is manufactured to precision standards of flexibility and mono-linked to the rotary movement. When pressure flexes the tube, the gauge pointer is always positively positioned, because it is mounted on the geared center shaft of the movement. Sustained high accuracy and long life are assured.

Choose your Ashcroft Duragauges made of components best suited to your needs. Eight Bourdon tube materials are available. Movement of stainless steel with nylon bearings and pinion gear for longest wear. Case materials: special aluminum alloy or tough phenol plastic.

The unique "Maxisafe®" Duragauge provides absolute protection to the viewer, plus easy and quick access to the mechanism. Your industrial supply distributor will help you select the best combination of components for your Ashcroft Gauge requirements. Phone him today or write for Catalog 300B.

MANNING MAXWELL & MOORE INC. M&M TRADE MARK

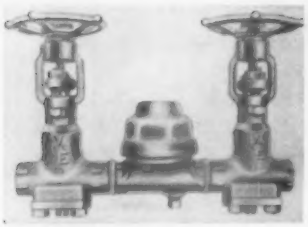
***ASHCROFT PRESSURE GAUGES***

*A product of*

**MANNING, MAXWELL & MOORE, INC.**

*Gauge and Instrument Division • Stratford, Connecticut*

*In Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario*



trap with integral strainer, check valve, and air vent, welded to either one or two forged-steel gate valves. Both the trap and valves are completely serviceable in the line in less time than it would normally take to remove a conventional valve or trap, according to the maker. The unit comes in ⅜ to 1-in. connection sizes for pressures to 250 psi. Source: **Velan Steam Specialties Inc., Beekmantown Rd., Plattsburgh, N. Y.**

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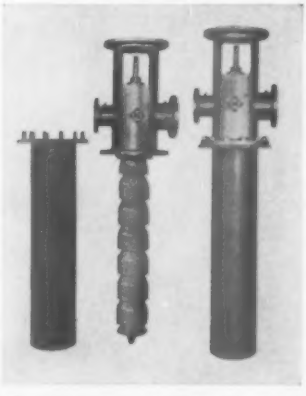


## Solution to NPSH

. . . problems may be found in this new pump, called Unitank, a vertical turbine type contained in a tank. Equipped with a vertical hollow-shaft motor, the pump comes in total dynamic heads from 20 to 400 ft. and capacities from 20 to 3,500 g.p.m.

It is particularly adpated to handling gasoline, fuel oils, and other liquids which vaporize. Source: **Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.**

●

## Storage tank

. . . of polyethylene can be obtained now with a capacity of 500 gal. The tanks are molded to retain all of the inherent characteristics of polyethylene with particular emphasis on permanent corrosion resistance. Styles available include full open head, closed head with openings, and flat or conical bottoms. Source: **Delaware Barrel & Drum Co., Box 1648-A, Wilmington, Del.**

## Air compressor

. . . that is X-shaped has been put on the market which, the maker claims, virtually eliminates vibration and has a higher cooling efficiency than older types. The X-shape was achieved by a short-stroke design with reduced cylinder overhang and by use of a wide-stance base.

The compressor comes in ratings of 1.5 to 15 hp. and 60 to 250 psi. Source: **Worthington Corp., 426 Worthington Ave., Harrison, N. J.**

**SHOWCASE . . .**

# New Equipment

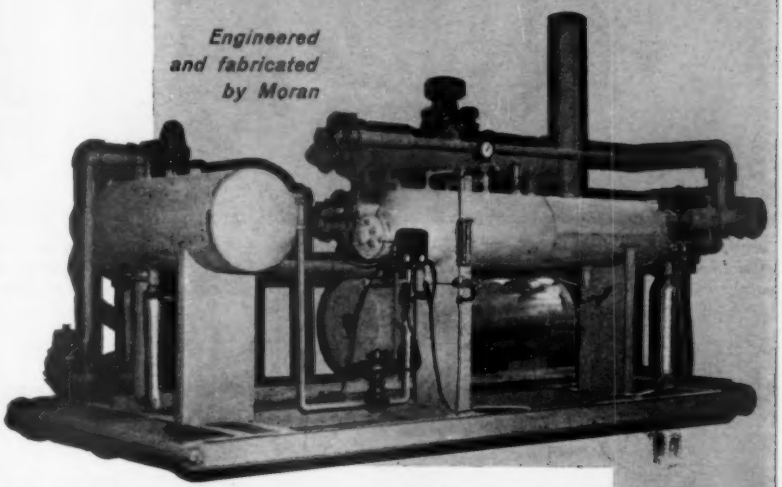
## Erratum

The new mass flowmeter described in the June 20, 1960 issue, pp. 153-156, available from Black, Sivalls & Bryson, Inc., weighs about 100 lb. instead of 10 lb. as reported.


MORAN

UNITIZED
HIGH PRESSURE GAS
PRODUCTION EQUIPMENT
FOR WELL HEAD
INSTALLATION

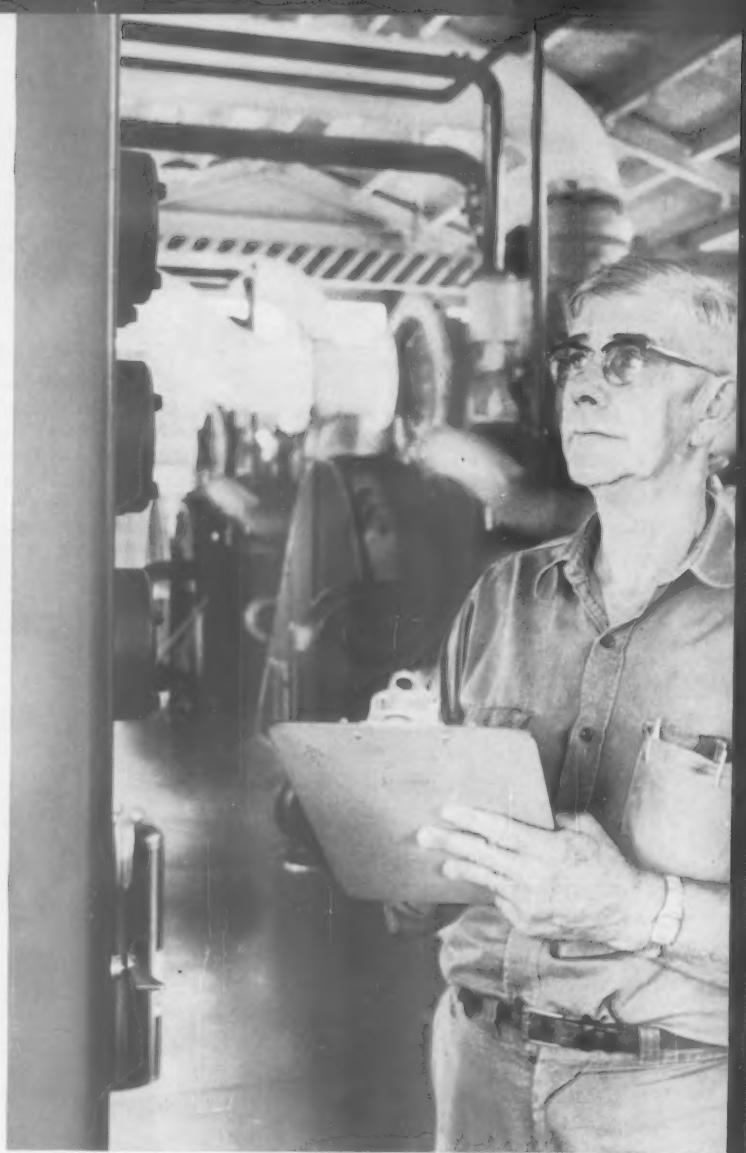
*Engineered and fabricated by Moran*



Let us quote you on your production installation

MORAN TANK COMPANY, INC.
POST OFFICE BOX 7006 TELEPHONE 4-5334 SHREVEPORT, LOUISIANA
HEATERS • TREATERS • SEPARATORS • DEHYDRATORS • TANKS

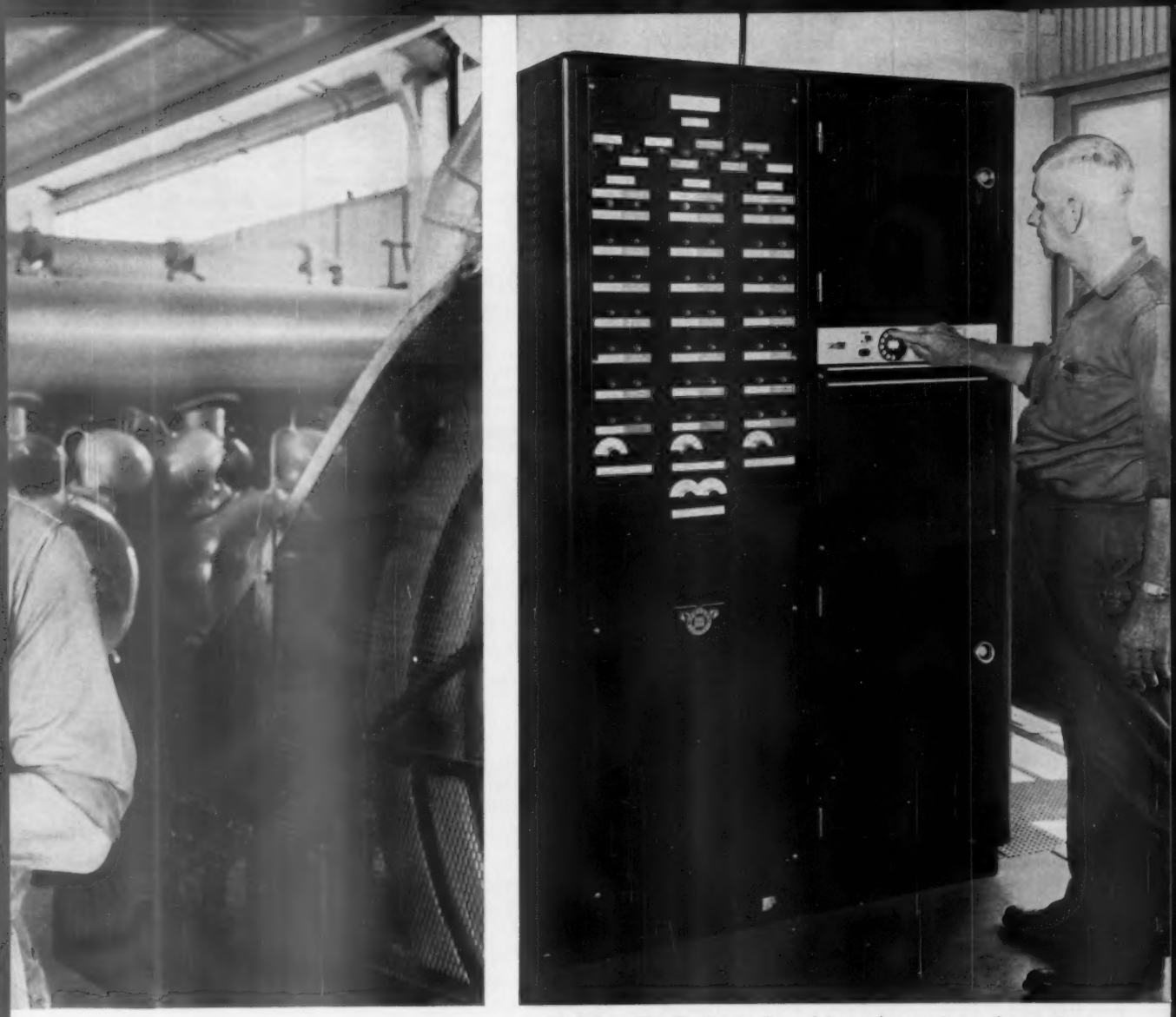
*At Crawford Station: En-Tronic Control actuates all functions at McArthur Station and records engine speeds and pressures. Shown here: W. E. Deeds, Engineer in Charge.*



*At McArthur Station: James Caldwell, Chief Engineer takes a reading from the En-Tronic Control of one of the Cooper-Bessemer compressors. This control actuates starting sequences and monitors the complete operation.*

# How Cooper-Bessemer equipped McArthur

TO START OR STOP McArthur Station's 1100 hp Cooper-Bessemer compressors, they simply dial a number. This storage field station of Ohio Fuel Gas Company is fully automatic, day and night... controlled from their Crawford Station 34 miles away by Cooper-Bessemer En-Tronic Controls. They start and stop the three GMVA Compressors... record engine rpm, discharge and suction pressures, and gas



*At McArthur: This En-Tronic Control is a telemetering and supervisory control unit for the entire operation. Compressors can be started or stopped from this location as well as from Crawford.*

# Station operates automatically round the clock

flow... and operate the 20″ main valves from the remote station.

Now completing two years of operation, McArthur Station has an impressive record of dependability.

It will pay you to investigate Cooper-Bessemer reciprocating compressors, centrifugal compressors, engines and En-Tronic Controls for *your* expansion and modernization plans. Call our nearest office.

*BRANCH OFFICES:* Grove City • New York • Washington
Gloucester • Pittsburgh • Chicago • Minneapolis • St. Louis • Kansas City • Tulsa • New Orleans • Shreveport • Houston • Greggton • Dallas Odessa • Pampa • Casper • Seattle • San Francisco • Los Angeles
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**GENERAL OFFICES: MOUNT VERNON, OHIO**

ENGINES: GAS - DIESEL - GAS-DIESEL
COMPRESSORS: RECIPROCATING AND CENTRIFUGAL, ENGINE, TURBINE OR MOTOR DRIVEN

**SHOWCASE . . .**

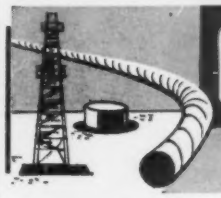
# New Literature

## Inert reinforced epoxy resins

. . . for rehabilitating tanks and metal surfaces are discussed in a new brochure now available. It illustrates methods employed by specialists to repair weeping riveted metal seams, pitted and leaking tank bottoms, and corroded, scaling interiors. The publication also shows three unusual corrosion problems solved with epoxy-resin application: a leaking over-water pipeline, a steel casing in highly corrosive soil, and a series of corroded coal chutes feeding plant boilers. Source: **Resin Applicators, Inc., 140 Cedar St., New York City.**

## Steel-wire-rope manual

. . . contains sections on the manufacture, handling, and installation of steel-wire ropes, and the weights and breaking strains of all conventional ropes normally used. The latter section is tab-indexed for quick and easy reference. Source: **Gourock Ropework Co., Ltd., Port Glasgow, Scotland.**

CSI

Practical ideas for BETTER Cathodic Protection

ARE YOU GETTING THE MOST FOR YOUR MAGNESIUM ANODE DOLLAR?

Many corrosion engineers are concerned over the composition specifications of magnesium anodes used to stop corrosion on pipe lines, oil well casing, etc.—and rightly so. But there is a more important factor that is sometimes overlooked. This is the *actual weight* of the bare anode, particularly in backfill-packaged units.

During the past several years an increasing number of the companies that use anodes have found it pays to spot check the metal weight of all anodes purchased. Often the small cost of pulling the anode from the packaged backfill has been worthwhile. 17-pound anodes have been found to weigh as little as 14 pounds, 32-pound anodes from 26 to 30 pounds, and 50-pound anodes only 44 pounds.

We at CSI feel that, regardless of the supplier, a spot check should be made of all anodes purchased. Of equal importance, requests for quotations and the subsequent purchase orders should *define all specifications.* As far back as 1945, the industry set maximum weight deviations for bare magnesium anodes at ±3 per cent of the designated weight. We suggest that, if this condition is specified and checked, you will be getting more for your magnesium anode dollar.

You'll find it to your advantage to check with CSI for engineering and installation services, and for quality supplies for both anode and rectifier installations. Estimates or competitive quotations without obligation. Let our stock-holder-employees demonstrate the economical and satisfactory service they can give you. Call or write today.

CSI

CORROSION SERVICES INCORPORATED

General Office: Tulsa, Okla.

Mailing Address: Box 787, Sand Springs, Okla.

Tel. Circle 5-1351

Cleveland 13, Ohio
1309 Washington Ave.
Tel. CHerry 1-7795


## Condensers

. . . for condensing steam and removing air and other noncondensable gases are described in a new bulletin. All products listed are available for immediate delivery. Bulletin Supplement 5AA-S includes data on barometric counter-current condensers, low-level eductor condensers, and ejector-type concurrent condensers. Source: **Schutte & Koerting Co., Cornwells Heights, Bucks County, Pa.**

## Hand-tool Catalog H-9

. . . (16 pages) illustrates and describes wrenches, pliers, cutters, screw drivers, punches, chisels, sockets, handles, extensions, socket sets, tool sets, tool chests, feeler gages, and miscellaneous tools. Source: **Owatonna Tool Co., 669 Cedar St., Owatonna, Minn.**

## Oil, gas pipe cleaning

. . . Bulletin 155-D concerns itself with the use of airless abrasive blast cleaning for removing mill scale and surface corrosion from pipelines. The 8-page literature uses photos, drawings, and diagrams to explain cleaning principles, equipment, and installations. Five case-history examples are also pictured and discussed. Source: **Wheelbrator Corp., Mishawaka, Ind.**

## Electric distribution systems

. . . for use by crews in oil fields, construction jobs, boilers, power-transmission towers, and other places where power is essential though the need is temporary, are outlined in Bulletin TL-4. The 4-page literature describes a 3-pole system and illustrates several applications. It also lists 2 and 4-pole systems along with accessories. Source: **Tuffline Div., Whitney Blake Co., New Haven 14, Conn.**

## Rust remover

. . . and metal conditioner called "Rust-I-Cide" saves labor and avoids replacement costs by removing rust and by conditioning metal surfaces, reports a 2-page bulletin just announced. Applications described include: (1) cleaning rusted equipment, machinery, tools, and piping; (2) removing discolorations from cutting tools; (3) preparing new metal, including aluminum and galvanized, and rusted metal for painting; and (4) cleaning bronze, copper, nickel, stainless steel, and vitreous enamel. Source: **Rusticide Products Co., 3125 Perkins Ave., Cleveland 14.**

# Jefferson Gas Processing Specialist makes a house call on ailing refinery

Your refinery engineers have already diagnosed your gas sweetening ailment . . . contaminants that are causing either corrosion, neutralization of solution, foaming, or a combination of detrimental results. Pinpointing the cause and cure remains. Here, Jefferson Chemical's Gas Processing Specialist can help.

He is no Merlin. His procedure is to sift and evaluate all pertinent data with your engineers. He will review such factors as the composition of the gas to be treated, the percentage of hydrogen sulfide and/or carbon dioxide in the gas and final purity desired; your choice of amines and solution strength; solution circulation rate which depends on quantity, temperature and pressure of the gas treated; operating conditions for absorption and reactivation. Often your problem, with specimen solutions, is referred to Jefferson's Austin Research Laboratories for analysis and study. This coordinated probing, plus Jefferson's vast fund of case experiences, will help you arrive at the best remedial action to minimize costly corrosion and solution contamination.

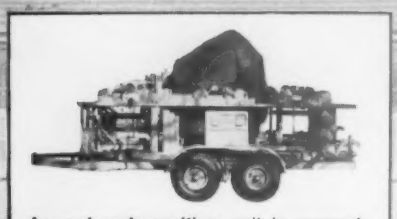
When you have a knotty gas sweetening problem, call in the Jefferson Gas Processing Specialist. He can provide prompt technical services plus ethanolamines in the quantity and purity you need . . . Jefferson Chemical Company, Inc., 1121 Walker Avenue, P. O. Box 303, Houston 1, Texas.

Ethylene and Propylene Oxides, Glycols, Dichlorides, Carbonates
SURFONIC® Surface-Active Agents • Ethanolamines • Morpholine
N-Alkyl Morpholines • Polyethylene and Polypropylene Glycols
Piperazine • Piperazine Salts • Nonyl Phenol • Caustic Soda

HOUSTON • NEW YORK • CHICAGO • CLEVELAND • CHARLOTTE • LOS ANGELES

**JEFFERSON CHEMICALS**

# NOW! A portable high-speed taping machine for Polyken cleans, tapes and



**In road-ready position,** unit is compact and completely mobile. Comes on 4-wheel tandem trailer or on steel skids. With 80 feet of pipe-handling trackage.

## New Polyken tape method handles ¾" to 4" pipe, cleans and coats 2,500 feet per hour and sets up anywhere

Probably the best thing about the Betzel taping machine and Polyken tape is the absence of all the nasty problems of hot dope. The highly mobile "Betzie," developed jointly by Polyken and A. E. Betzel, sets up in an hour (comes down in half the time).

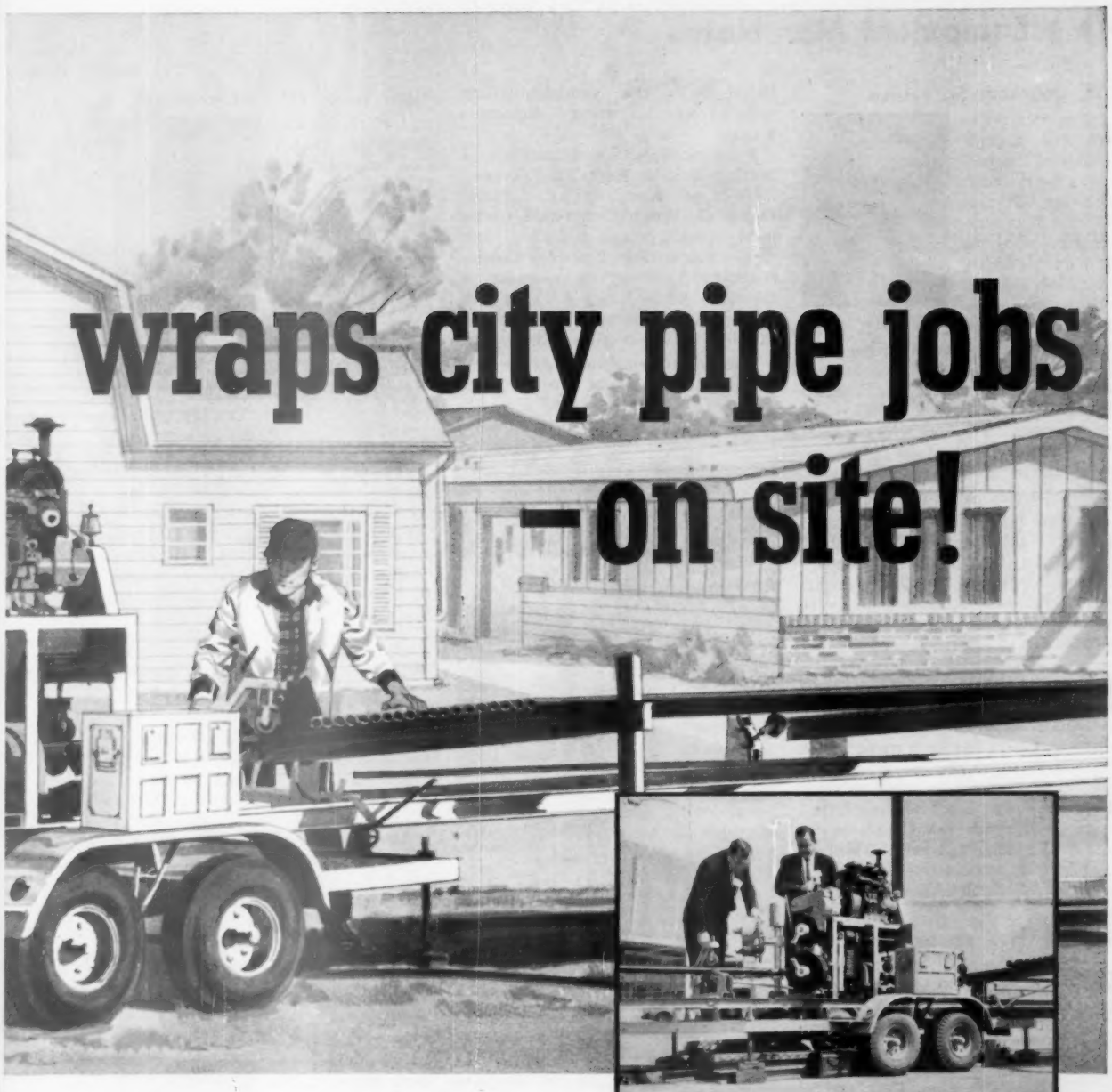
With only 6 men, or less, you run a continuous cleaning, coating and wrapping operation that processes 2,500 lineal feet per hour. Takes only 10 minutes to switch pipe sizes. And the savings? Well, just compare the time, labor, and small investment against the average hot dope operation.

### The practical Polyken way

With Polyken tape you know the coating is always ready. Goes on factory-smooth, too. No primer, no drying or cooling time. No fumes or fire hazards.

What's more, permanent Polyken tape can take almost anything—as already proved by its many hundreds of miles and years of hard work. It's being used in such tough terrain as the

# wraps city pipe jobs —on site!



As the pipe spins through the "Betzie," twin powered brush heads afford dynamic cleaning—as shown in this demonstration at the 1960 N.A.C.E. meeting in Dallas, Texas. Other standard equipment includes twin brake-type tape and outer wrap spindles for rapid change of rolls, and an adhesive attachment for fast-gluing outerwrap.

Iranian desert, Canadian cold, Florida swamps and southern California mountains.

For the full particulars on both machine and tape, look up your Polyken representative. Or simply send the coupon below.

THE MODERN WAY

Polyken®

EXPERIENCED IN PROTECTIVE COATINGS

THE KENDALL COMPANY
Polyken Sales Division

©1960 The Kendall Company

**Polyken Sales Division, Dept. OGJ-8**
**309 W. Jackson, Chicago, Illinois**

Gentlemen: Please provide me with information on the new Polyken pre-coating method using the Betzel tapester.

Name _____

Address _____

City _____ State _____

# ▶▶▶ Equipment Men Notes

### S. E. Johnson, Sr. retires

. . . as vice president and director of sales of Cooper-Bessemer Corp., following 42 years of continuous service. He joined the Mount Vernon, Ohio, firm in 1918, and was named assistant sales manager in 1932. Johnson became acting sales manager in 1944, and the following year was appointed a vice president and director of sales. He has been a company director since 1946, and will continue to serve in that capacity.

### Schlumberger assigns five

. . . to new positions in the company. General Field Engineer R. D. Shay, of Big Lake, Tex., has been moved to Artesia, N. M., as a sales engineer; and W. B. Jackson, sales engineer at Beaumont, has been assigned to Liberty, Tex.

T. G. Evenson, general field engineer at Cut Bank, Mont., moves to Newcastle, Wyo., as a sales engineer. S. J. Rusen, location manager at Grand Junction, Colo., has been named sales engineer.

F. D. Fulkerson, location manager at Kermit, Tex., has been transferred to the Northwest Texas area as an area staff specialist, where he will be in charge of coordinating all Schlumberger wireline-completion services.

### Noah E. Hull elected president

. . . of the National Society of Professional Engineers. Hull is vice president and general manager of Hughes Gun Co., and is assistant to the vice president, manufacturing, of Hughes Tool Co.

### Dorr-Oliver, Inc. announces

. . . a series of reassignments in its organization directed toward centralization of related functions.

William J. Fox, now vice president-engineering, assumes the newly created post of vice president—domestic operations. Douglas C. Reybold takes on responsibility for the research, development, legal, and patent functions. H. J. Talbot becomes managing director—Europe, and G. E. A. Schroth, managing director of Dorr-Oliver N.V., the Netherlands subsidiary, will be deputy director—Europe.

Promotions and assignments in engineering include: Harry E. Lundberg, director of engineering, replacing Glenn O. Wilson, appointed to the newly created post of director of technical coordination; Jack S. Chasteen, replacing Lundberg as manager of filtration engineering; Charles A. Schreiber, succeeding Chasteen as manager of engineering coordination.

The general equipment engineering division has been split into two units: Russell C. Raynor heads the new sedimentation engineering division, and Philip B. Booth heads the reorganized general equipment engineering division. William A. Hirschfield has replaced Booth as manager of Fluo-Solids engineering.

### Eldon L. Seymour is named

E. L. Seymour

. . . southeast regional sales manager for Union Wire Rope Corp. to succeed George W. Golay. Seymour will move to Jacksonville, Fla., from Oklahoma City where he has been district sales manager. He has worked out of Oklahoma City since joining Union Wire Rope, a subsidiary of Armco Steel Corp., as a sales representative in 1953.

Replacing Seymour at Oklahoma City is C. E. Giese, a company member since 1956. He will move from Tulsa, where he has been assigned since spending a year in the Kansas sales territory.

The Kansas City corporation also announced that Frank V. McClure has been assigned as a sales representative in the New Orleans area, reporting to C. G. Ratzlaff, district manager there. A product engineer with the firm the past 4 years, McClure has worked with salesmen on engineering problems.

### W. F. Bliss, Jr. joins

. . . Universal Oil Products Co. as product sales representative, reports M. R. Schrein, senior vice president. Bliss will cover the Gulf Coast, operating out of Houston.

An 8-year veteran of the petroleum, petrochemical, and chemical industry, Bliss was with Geigy Industrial Chemicals Division before joining UOP.

### Piper becomes sales manager

C. F. Piper

. . . of Drilling Equipment Mfg. Co., according to C. L. Knight, general manager of the Oklahoma City firm. Formerly special sales representative for Demco, C. F. (Chuck) Piper has spent 12 years in selling with Ford Motor Co., Rockwell Mfg. Co., and Pittsburgh Valve & Fitting Corp.

### Four representatives appointed

. . . by U. S. Steel Corp's Oil Well Supply Division. Frank W. Bruner takes over as city representative at Shreveport, and W. E. Hanby assumes a field-representative post at Houston. California representatives are Harold E. Throop, Ventura, and Donald E. Mosher, Coalinga.

### Mountain Iron & Supply opens

. . . a new sales facility in Gillette, Wyo., headed by Bob Dreiling, store superintendent, and Jim LeOrange, manager. Dreiling formerly was connected with the Misco store at Russell, Kans., and LeOrange was at Great Bend, Kans.

The Gillette store is part of the company's Rocky Mountain region, which is directed by W. E. (Bill) Frevert, Denver vice president. Available at the new outlet is a complete stock of parts for rotary and other types of production, including a full stock of tubular material.

### Frank Proctor, Jr. is named

F. A. Proctor, Jr.

. . . assistant division manager for the West Texas area of Rector Well Equipment Co., reports J. L. Pinkard, general sales manager. Proctor will be working with W. P. Knight, division manager, serving all of West Texas and eastern New Mexico from Rector's Midland office.

Proctor moves from Rector's general offices, where he has been serving as company representative to the headquarters offices of Rector distributors. He has been associated with the oil industry in Texas, Oklahoma, and New Mexico for the past 12 years.

# top

**CONSOLIDATED SAFETY RELIEF VALVES have a special "O" Ring Seat Seal that stops leakage completely**

*Consolidated Safety Relief Valves are available in both Standard and Balanced Bellows design for extreme corrosive applications.*

# tightness

The Seal is a resilient ring set in the valve disc. It maintains no-leak tightness by contact with a specially curved seating surface on the valve nozzle, yet does not carry the seat load imposed by the valve spring.

Tightness is maintained at operating pressures far closer to set pressure than with metal-to-metal seats alone. Tight closure is as efficient after "simmer" as on normal blowdown. Piping strains are absorbed far better by the resilient seal than all-metal seating. If the tough seal is ruined by entrained abrasives, replacement is easy. Seals are available in materials that resist corrosive fluids. Maintenance costs are greatly reduced.

Standard Consolidated Safety Relief Valves have an eductor tube that removes pressure from the closed bonnet. Only the spring controls valve action. You get guaranteed capacity ratings and highest dependability—absolute protection for personnel and equipment. Additionally, there is the economy of converting the Standard valve to the Balanced Bellows type in your own shop. Get complete details. Write for Bulletin 1940.

MANNING MAXWELL & MOORE INC. TRADE MARK

***CONSOLIDATED SAFETY RELIEF VALVES***

***A product of***

**MANNING, MAXWELL & MOORE, INC.**

*Valve Division • Tulsa, Oklahoma*

*In Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario*

News! The best features of
modern bearing design combined and refined in

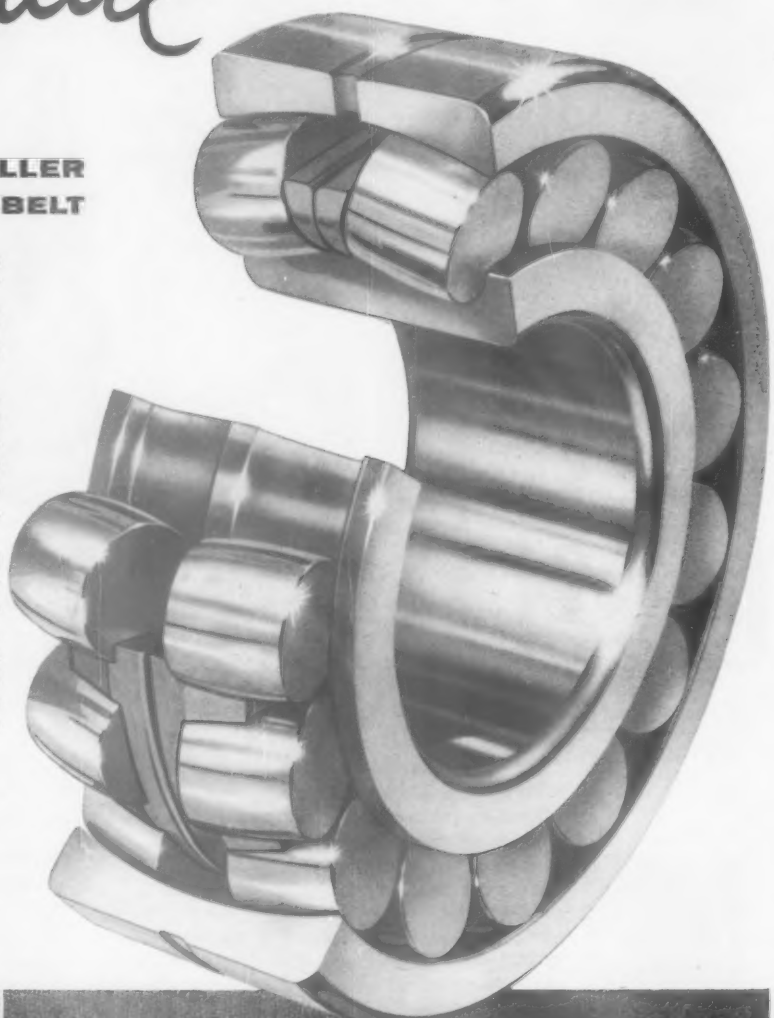
# Spherical

**SELF-ALIGNING ROLLER BEARINGS BY LINK-BELT**

BIG, mirror-smooth convex rollers *plus* heavy, broad-shouldered inner race *plus* centrifugally-cast bronze, precision-machined retainers! Only from Link-Belt do you get ALL that is best in modern bearing design.

Individually, these elements represent major improvements on accepted design concepts. Collectively, they constitute the most efficient spherical roller bearings available . . . promise unequalled economies, whatever the application.

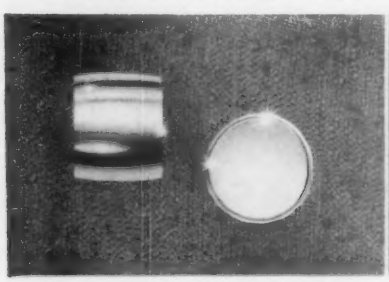
Your Link-Belt office or authorized stock-carrying distributor will gladly explain the many performance advantages evolved with this new design. And either can furnish full data on industry's most complete line of ball and roller bearings . . . pillow blocks and flanged, flanged-cartridge, cartridge and take-up blocks.



**LINK-BELT**

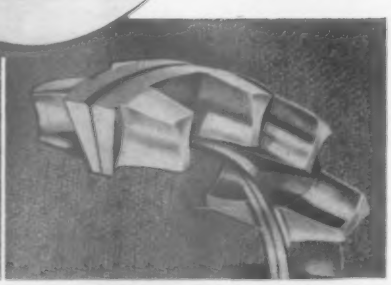
**MANUFACTURERS OF SELF-ALIGNING BALL AND ROLLER BEARINGS**

LINK-BELT COMPANY: Indianapolis 6, Houston 1, Dallas 26, Odessa, Tex., New Orleans 16, Shreveport, La., Los Angeles 22 (Montebello), Scarboro (Toronto 13); Export Office, New York 7. Distributors in All Fields. 14,019-B



**BIG, HIGHEST-CAPACITY ROLLERS.** Each bearing has a maximum number of rollers —as large as possible, yet all components are in optimum balance.

**HIGH, HEAVY INNER RACE FLANGES** present convenient hold for assembly and removal of bearing without cutting away shaft, avoid any need to skimp on shaft shoulders.



**PRECISION-MACHINED, CENTRIFUGALLY-CAST BRONZE RETAINERS** have many times more support and ability to withstand high stress. They are not stampings. Design assures maximum bearing efficiency.

### Medical Supply Co. appoints

. . . Paul W. Saunders as merchandising manager in its general offices at Rockford, Ill., and Harry J. Ellis as southwestern regional sales manager with headquarters at Dallas. The company is a primary supplier of first-aid equipment to the petroleum industry.

P. W. Saunders

H. J. Ellis

Saunders, for the past 8 years, has been the firm's regional sales manager of 11 southern states. Among his new duties will be supervision of advertising, sales programing, and market and product research. Ellis formerly was Gulf Coast division safety supervisor of Loffland Brothers Co., Inc., New Iberia. La., for 7 years.

### Service laboratory established

. . . in Liberal, Kans. by Dowell Division of The Dow Chemical Co. It's equipped to handle formation and fluid analyses and other testing required to diagnose well conditions and plan proper technical treatment.

The laboratory will occupy a part of the new Dowell building there, which also houses the company's sales office. R. L. Root, who joined Dowell in 1957 as a chemist in the company's central laboratory in Tulsa, is in charge of the lab. Just recently the division transferred him from Tulsa.

### Tuboscope Co. makes two

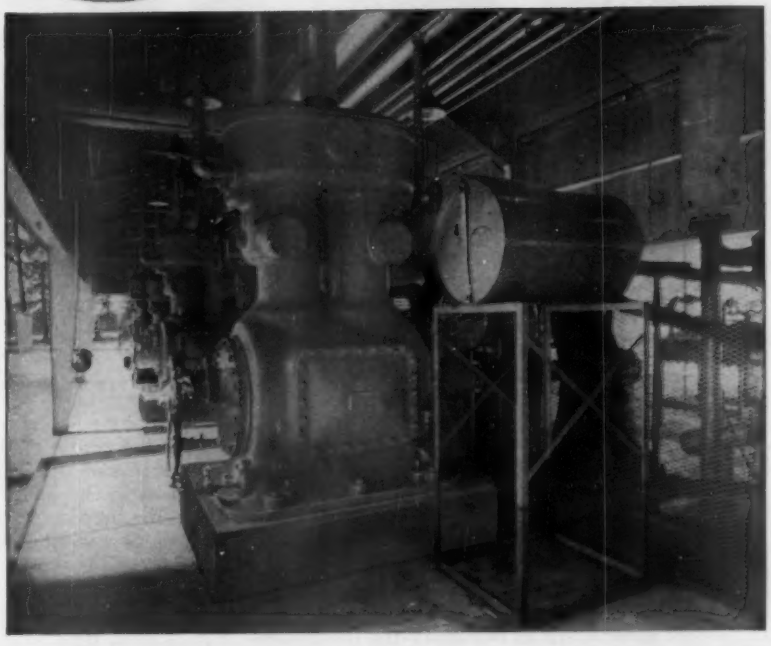
. . . sales manager appointments, according to Bill E. Thomas, marketing manager of the Houston firm. J. V. Bond, Jr., will head up the Pittsburgh division and Bill McIntyre assumes responsibility for the southwest zone.

J. V. Bond, Jr.

Bill McIntyre

Bond will manage sales for Tuboscope's new Amalog pipe-inspection plant at Walker's Mill, Pa. McIntyre will move from the northwest zone to manage sales in Houston, Kilgore, and Corpus Christi.


# 364 TONS OF FRICK REFRIGERATION . . .



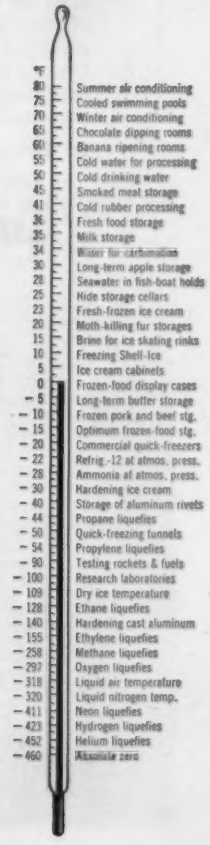
## PRODUCE PROFITABLE YIELD OF PROPANE, BUTANE AND NATURAL GASOLINE

• The location: about 30 miles north of Lake Charles, Louisiana. The plant: the Upper Bearhead Creek Sand Unit, operated by H. L. Hunt. The refrigeration equipment: designed and manufactured by the Frick Company.

This is only one of several dozen natural gasoline plants equipped by Frick. Here, as in others, rich casinghead gas is compressed to 950 Psig. and then dehydrated with the temperature being lowered to about 0° F. in a gas chiller that uses ammonia as the refrigerant. This way, hydrocarbon liquids are condensed and then fractionated into Propane, Butane and natural gasoline.

If you have a refrigeration problem of *any* type, Frick has the answer. A Frick engineer will call and discuss it with you at your convenience. No obligation at all. Write:

**FRICK COMPANY**
**Waynesboro, Pennsylvania**


°F
80 Summer air conditioning
75 Cooled swimming pools
70 Winter air conditioning
65 Chocolate dipping rooms
60 Banana ripening rooms
55 Cold water for processing
50 Cold drinking water
45 Smoked meat storage
41 Cold rubber processing
36 Fresh food storage
35 Milk storage
34 Water for carbonation
30 Long-term apple storage
28 Seawater in fish-boat holds
25 Hide storage cellars
23 Fresh-frozen ice cream
20 Moth-killing fur storages
15 Brine for ice skating rinks
10 Freezing Shell-Ice
5 Ice cream cabinets
0 Frozen-food display cases
− 5 Long-term butter storage
− 10 Frozen pork and beef stg.
− 15 Optimum frozen-food stg.
− 20 Commercial quick-freezers
− 22 Refrig.-12 at atmos. press.
− 28 Ammonia at atmos. press.
− 30 Hardening ice cream
− 40 Storage of aluminum rivets
− 44 Propane liquefies
− 50 Quick-freezing tunnels
− 54 Propylene liquefies
− 90 Testing rockets & fuels
− 100 Research laboratories
− 109 Dry ice temperature
− 128 Ethane liquefies
− 140 Hardening cast aluminum
− 155 Ethylene liquefies
− 258 Methane liquefies
− 297 Oxygen liquefies
− 318 Liquid air temperature
− 320 Liquid nitrogen temp.
− 411 Neon liquefies
− 423 Hydrogen liquefies
− 452 Helium liquefies
− 460 Absolute zero

# UNION

More and more purchasing agents are employing a new concept in buying called value analysis. In it the integrity of the seller weighs heavily since it assures maintenance of uniformly high product quality.

Advanced procedures and equipment in Union's foremost laboratory enable our technicians to determine the life expectancy of wire ropes. Much of the time of our engineers is spent in the field checking to see that Union wire ropes live up to or exceed predetermined life expectancy rating under varying operating conditions.

In living with wire ropes and slings from the cradle to the grave, our engineers found new constructions were necessary. On many of the tougher jobs the life expectancy of standard wire ropes of the highest quality was too short.

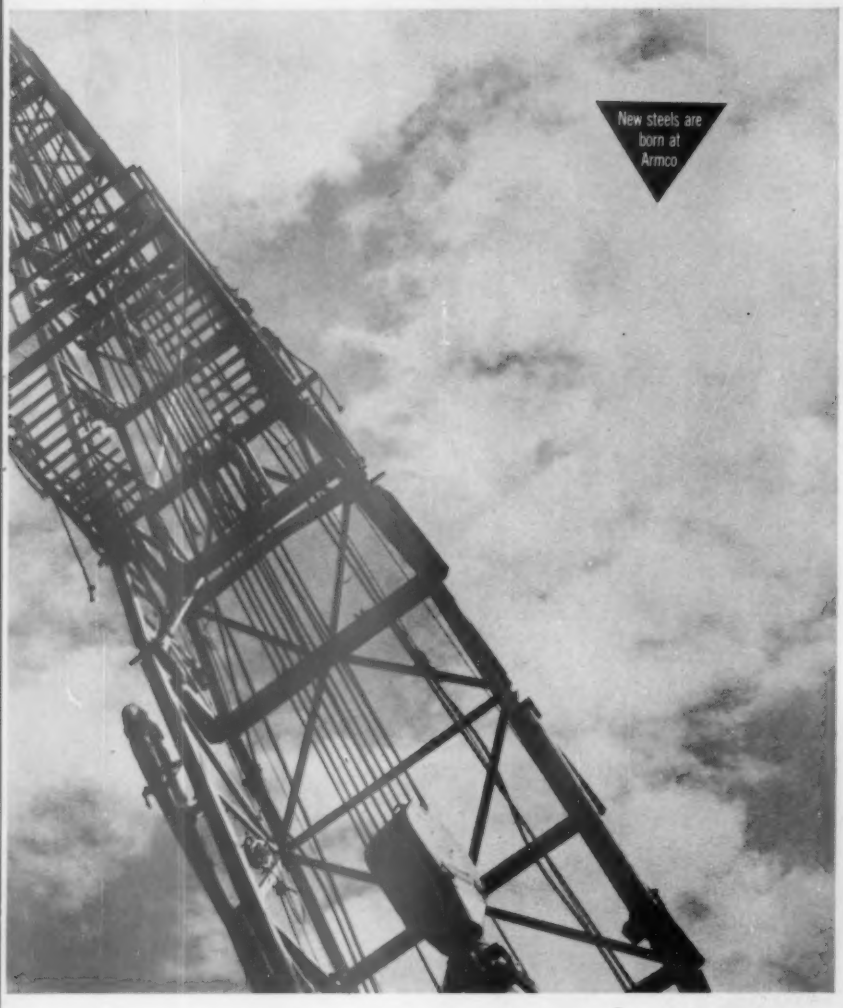
In the oil industry this was the situation until after Union engineers spent months in the oil fields and laboratory developing a special construction tailored to meet the tough load and wear conditions imposed by rotary rigs. For many years ultimate low cost Tuffy rotary lines have helped battle the rising cost of drilling deeper wells, including the world's deepest.

## **Tuffy** Rotary Lines Are Ton-Mile Engineered

**Tuffy Standard Rotary Line** is "ton-mile" engineered for standard rotary rigs and for large jackknife rotary rigs. **Tuffy Jackknife Rotary Line** is for smaller jackknife rigs drilling to depth of 6,000 feet.

### Ultimate Low Cost Wire Ropes For Well Servicing

For a third century Union wire ropes have demonstrated the longer service life that makes them the ultimate low cost wire ropes in oil well servicing. There are Union standard constructions of rod and tube pulling lines, rod hanger line, cable tool drilling and casing lines, sand and pump lines and winch lines.

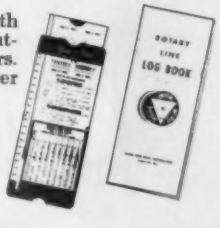



Wire ropes travel hundreds of ton-miles on rotary oil drilling rigs lifting and lowering drill pipe and tools out of and into the hole. On the world's deepest oil well Tuffy Rotary Line handled the longest string of well casing ever run. The final live load totaled 700,000 lbs.

**Quickly Available...** Around the oil world leading oil field supply stores make the ultimate low cost Union Standard Wire Ropes and Tuffy Rotary Lines quickly available.

### Ton-Mile Indicator Free

It's quick and easy to figure ton-miles of service with this slide rule chart. Designed for use in following cut-off practice originally developed by Union engineers. Write Union Wire Rope Corporation, 2102 Manchester Ave., Kansas City 26, Missouri.

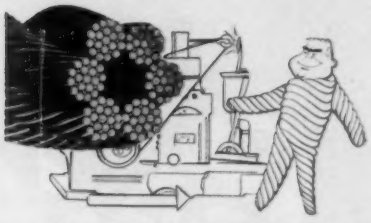


3-O

## Tuffy. Wire Rope Tips

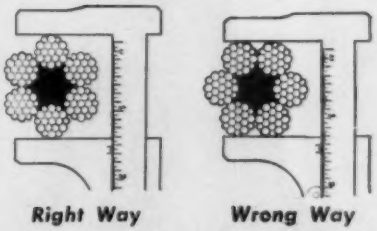
**Money-Saving Information on the Use and Care of Wire Rope**

### Wire Rope is a "Machine" of Moving Parts



...and every part must fight destructive forces! A "look inside" a section of wire rope reveals a precision assembly of working parts. They are subjected not only to external and internal stresses, but also to heavy surface pressures and abrading. All these forces may be sustained while the rope is running at high speeds, and abruptly changing direction. That's why different uses require different constructions of wire rope.

### How to Measure Rope Diameter



*Right Way* *Wrong Way*

There's only one right way: Use machinist's calipers, and be sure to measure the widest diameter. A slight shift of the rope in the calipers (shown at right above) might cause ordering an undersize rope.

### How to Measure Tread Diameter

Easy, and important. Select the smallest sheave or drum to be used with the new wire rope, and measure actual diameter at lateral center (shortest dimension) of tread.

**Would you like a copy of a booklet in which more than a score of Tuffy Tips like those above are reproduced. If so, write Union Wire Rope Corporation, 2102 Manchester Ave., Kansas City 26, Missouri.**

**UNION** Wire Rope

*Subsidiary of* **ARMCO STEEL CORPORATION**

OTHER SUBSIDIARIES AND DIVISIONS: Armco Division • Sheffield Division • The National Supply Company
Armco Drainage & Metal Products, Inc. • The Armco International Corporation • Southwest Steel Products

# *Smith* ROCK BITS

## TOPS ON BOTTOM

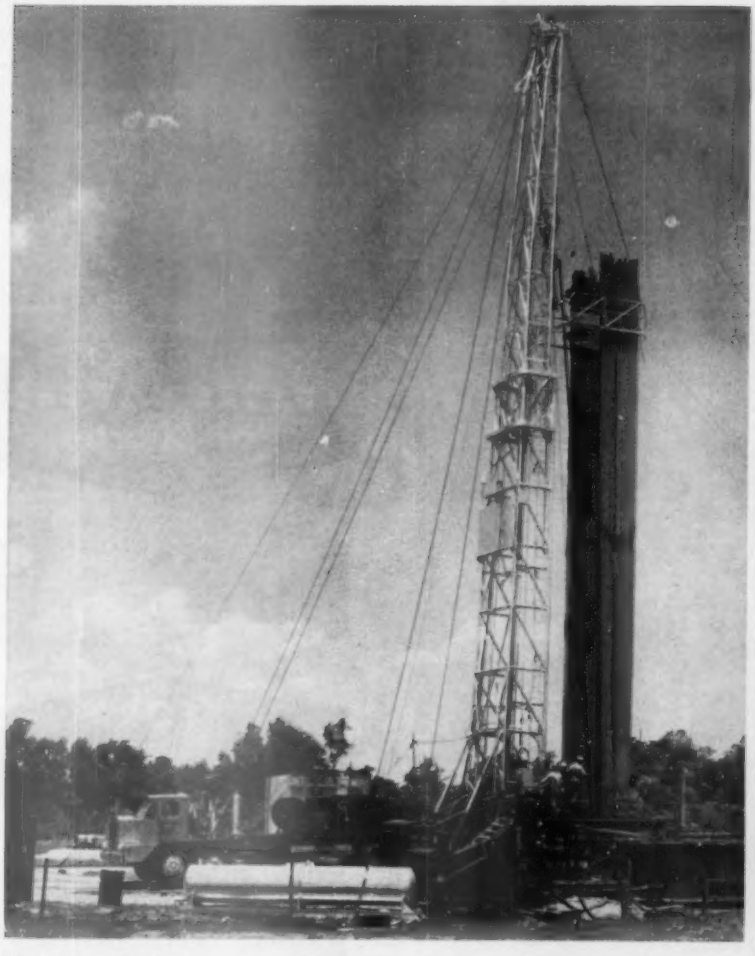
***MORE FOOTAGE***

***FASTER PENETRATION***

***FULL-GAGE HOLE***

*Smith* TOOL CO.

COMPTON, CALIFORNIA
Branches in Principal Oil Centers
Throughout the World



THIS workover rig is recompleting a new gas pay in Louisiana below 12,000 ft.

SHOWN beside rig are John W. Smith, owner, and A. P. Allemand, driller.

# Workover rig has deep capacity

AN EXAMPLE of a contractor with new well-servicing equipment is this unit owned and operated by John W. Smith Well Service & Workover Co., Lockport, La. It is one of the recently introduced Explorer Rocket series manufactured by Franks Division, Cabot Shops, Inc., Pampa, Tex.

The rig is working on the Pan American I Lever-Leche Gas Unit in North Thibodaux field of Lafourche Parish, Louisiana. Top model in the Rocket series is the Model 658 which has a capacity of pulling 15,000 ft. of 2⅞-in. tubing or 10,000 ft. of 2⅞-in. drill pipe. The self-propelled double-

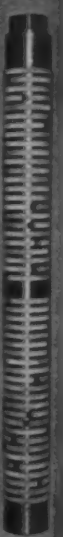
Let R-u-b-b-e-r Take The Wear
in your sucker rod pumps

IT COSTS YOU LESS THAT WAY

● MARTIN RUBBER & DUCK RINGS give excellent life in dirty abrasive fluids . . . high or low gravity . . . much or little water . . . shallow or deep wells. They last for years in the easier pumping wells. Replacement rings cost comparatively little.

● MARTIN PLUNGER BODIES, precision grooved, drilled and threaded (no underneath fluid passage), usually last for years. Tube or barrel costs are often cut in half.

● The replaceable SYNTHETIC RUBBER GUIDES in MARTIN CAGES last longer than any metal, and the cushioning of the ball increases your ball & seat life. Results are often truly amazing. (Patent No. 2,591,174)



*Write for our new 1960 catalog or see it in the new Composite (24th Edition). All products sold thru supply companies.*

JOHN N. MARTIN
*Manufacturer*
3 W. BRADY STREET • TULSA, OKLAHOMA

drum unit has over-all dimensions of 57 ft. long, 8 ft. 1 in. wide, and 13 ft. 6 in. high. Total weight is 69,820 lb. The sand drum is removable and when it is not mounted the total weight is reduced to 64,320 lb.

A hydraulic telescoping 96-ft. derrick has a capacity up to 275,000 lb. The racking board will hold 16,000 ft. of 2⅞-in. tubing and is automatically raised and lowered.

A typical unit in the Model 658 series will have a Cummins NH 220 power engine and will be mounted on an International RF-214 251-in. WB tandem-front truck. In typical performance maximum single-line speed is 1,050 ft. per minute at 1,800 r.p.m. and maximum single-line pull is 49,400 lb.

## Active Rigs*

| | Rotary | Cable | Total† |
|---|---|---|---|
| Alabama | 5 | 0 | 5 |
| Alaska | 5 | 0 | 5 |
| Arizona | 1 | 0 | 1 |
| Arkansas, South | 26 | 0 | 26 |
| California, Offshore | 5 | 0 | 5 |
| Inland | 109 | 2 | 111 |
| Colorado, | | | |
| excl. Four Corners | 14 | 4 | 18 |
| Four Corners | 9 | 2 | 11 |
| Florida | 2 | 0 | 2 |
| Georgia | 2 | 0 | 2 |
| Idaho | 0 | 0 | 0 |
| Illinois | 38 | 16 | 54 |
| Indiana | 11 | 24 | 35 |
| Iowa | 0 | 0 | 0 |
| Kansas | 114 | 19 | 133 |
| Kentucky, Western | 6 | 51 | 57 |
| Louisiana, North | 119 | 0 | 119 |
| South Inland | 230 | 0 | 230 |
| Offshore | 63 | 0 | 63 |
| Michigan | 51 | 44 | 95 |
| Mississippi | 65 | 0 | 65 |
| Missouri | 1 | 1 | 2 |
| Montana | 24 | 1 | 25 |
| Nebraska, East | 2 | 0 | 2 |
| West | 22 | 0 | 22 |
| Nevada | 1 | 2 | 3 |
| New Mexico, East | 75 | 20 | 95 |
| West | 32 | 6 | 38 |
| North Dakota | 14 | 0 | 14 |
| Okla., excl. Panhandle | 234 | 84 | 318 |
| Panhandle | 22 | 6 | 28 |
| Ohio | 5 | 107 | 112 |
| Oregon | 1 | 0 | 1 |
| South Dakota | 1 | 1 | 2 |
| Texas, Offshore | 1 | 0 | 1 |
| East | 58 | 0 | 58 |
| Upper Gulf Coast | 100 | 0 | 100 |
| North | 101 | 0 | 101 |
| Panhandle | 46 | 9 | 55 |
| S. W., Corpus Christi | 134 | 0 | 134 |
| S. W., San Antonio | 31 | 1 | 32 |
| West | 200 | 23 | 223 |
| West Central | 84 | 19 | 103 |
| Utah, North | 11 | 0 | 11 |
| South | 17 | 0 | 17 |
| Washington | 1 | 0 | 1 |
| West Virginia | 7 | 218 | 225 |
| Wyoming | 67 | 3 | 70 |
| Reported U. S. Total | 2,167 | 663 | 2,830 |

*Report to AAODC by the International Oil Scouts Association. †As of July 15, 1960.


"SCOT" FORGED SEAMLESS RING GASKETS

MINIMUM HARDNESS

*Ask for "SCOT" Gaskets at your Supply Store.*

For ring Groove Flanges forged from reforging billets in the following materials in stock: Soft Iron, Copper, Aluminum, Inconel, Monel, Nickel; 1¼ Cr ½ Mo., 2¼ Cr 1 Mo., 9 Cr 1 Mo. 304, 310, 316, 321, 347, 405, 410, 430, 502, 304L, 316L, Nickel L.

Machined in all A.P.I.—A.S.A. Special sizes and other type, Including BX.

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8220 Atlantic Boulevard
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PETROLEUM ENGINEERS
STEPHENS ENGINEERING
WICHITA FALLS, TEXAS

RESERVOIR ENGINEERING
Water Flooding Gas Repressuring
EVALUATION CORE ANALYSIS
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Cost Estimates, Design, Installation
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FOR OIL FIELD SERVICE

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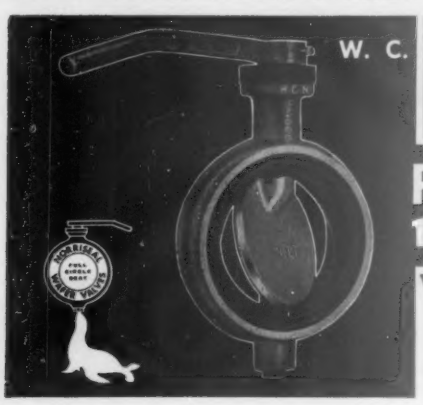
429 BALTER BLDG.
New Orleans 12, La.
Phone: Magnolia 6824



W. C. NORRIS VALVES
Field Tested and Approved
150 psi working pressure
WRITE FOR NEW VALVE BULLETIN
P. O. Box 1739, Tulsa

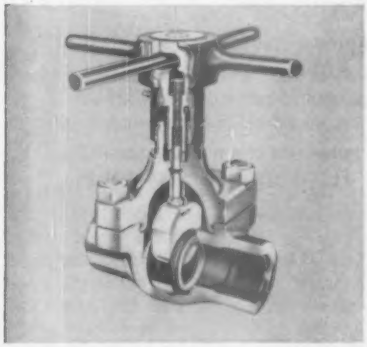
# "It's a good feeling to know we have Edward Mudwonder Valves on our #10 rig"

Johnny Sharon, Drilling Superintendent for the Power Rig Drilling Company of Lafayette, Louisiana, has had a lot of experience with Edward Mudwonder valves. Recently we talked to Johnny at Land Rig #10.

*"As far as we know," Johnny said, "our #10 rig is the most powerful rig in Louisiana, and it's as versatile as a rig can be. We can drill competitively at anything from 12,000 to 25,000 feet because the rig is designed for versatility, and the equipment on it is selected for rugged, dependable duty. Mudwonder valves give us just that kind of service.*

*"We have replacement gates and seat inserts on hand, but it's a good feeling to know that we probably won't have to use them. My experience with Mudwonder valves on this new rig bears out the experience I've had on other rigs. That's why #10 is an all-Mudwonder rig, from mud tanks through stand pipe."*

This confidence in Edward Mudwonder valves is found wherever you go in the drilling fields. Mudwonder valves are built in 2", 3" and 4" sizes, with screwed or flanged ends, for 2000 psi WP (4000 psi test) and 3000 psi WP (6000 psi test) service and in 2" size for 5000 psi WP (10,000 psi test) service. See your favorite oil field supply store, or write Edward Valves, Inc., East Chicago, Indiana. Subsidiary of Rockwell Manufacturing Company. 6018



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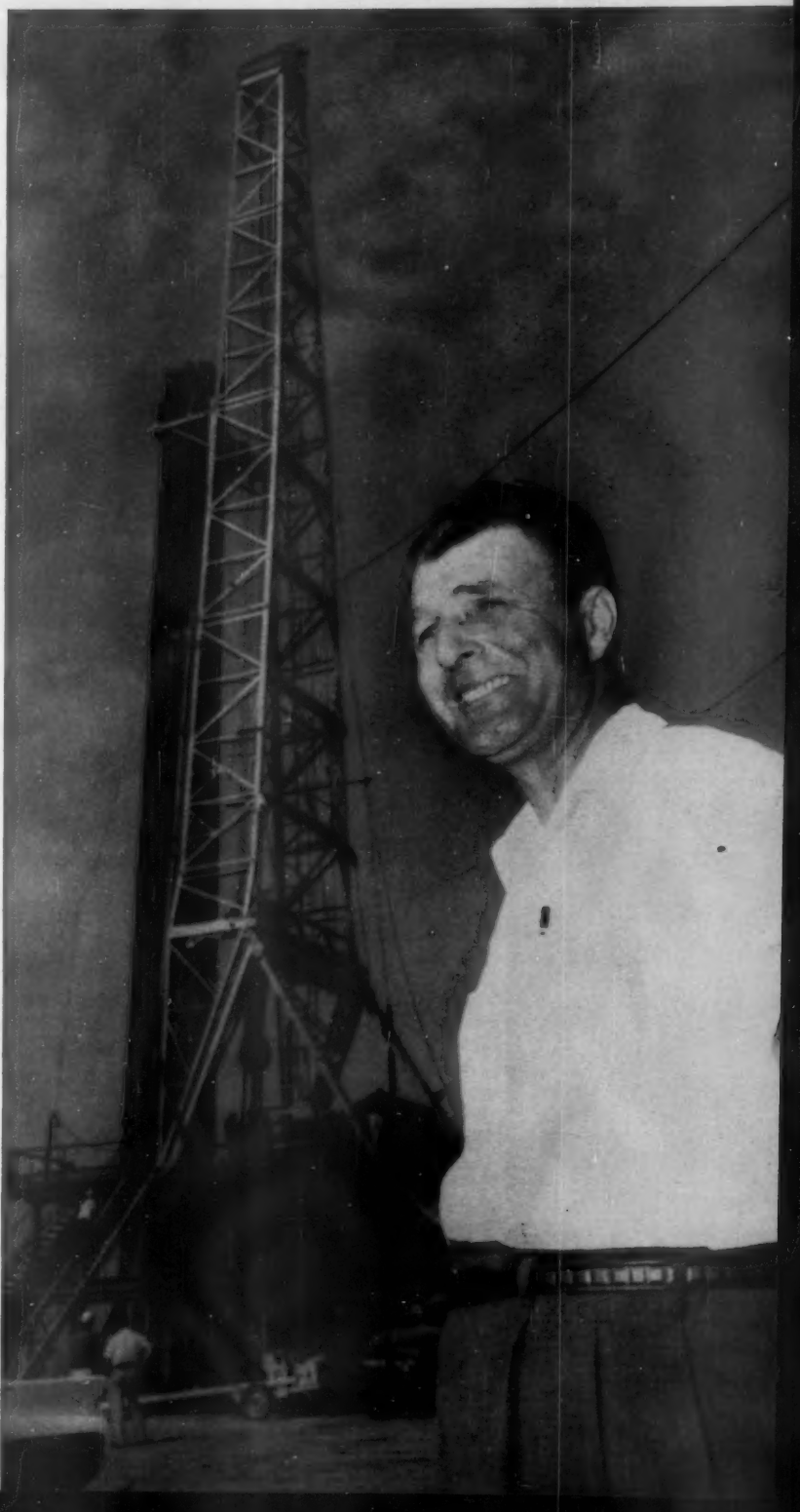

# brass tacks

## FROM HALLIBURTON

"Dry" hole turns producer

Fracpac whips sand-up problem in old well

Hydra-Jet and MCA save Wyoming well

## FRACTURING FACTS

The cable tool crew was very disappointed when tests showed this shallow well in Eddy County, New Mexico to be a dry hole. Halliburton was called to do a Sandoil Fracturing Job using 79,550 gallons of lease crude and 2,800 sacks of sand. Injection of approximately 7,600# of sand/per minute was easily accomplished with Halliburton's versatile pumping, proportioning, and bulk sand handling equipment. After recovering fracturing oil, the "dry" hole tested out at 121 bbls./day.

This old well in Jackson County, Texas could not be produced because sand and shale continually flowed into the hole. With Halliburton's Fracpac technique, 28,000# of 20-40 and 2,000# of 10-20 sand was pumped into the formation and well bore to serve as a filtering medium. A liner was then inserted to retain the filtering sand. Since treatment 34 months ago, the well has produced 22 bbls./day. Numerous other wells in this same area have also been converted to profitable producers by this technique.

After completing this new Tensleep well in Hot Springs County, Wyoming for 35 bbls. water with trace of oil, operator was about ready to abandon. He talked to Halliburton and decided to squeeze perforations with 100 sacks of Pozmix Cement, then re-perforate with Halliburton Hydra-Jet. After squeezing four holes were placed in each of three intervals 3261-67. 250 gallons of Halliburton Mud Cleanout Agent (MCA) was spotted opposite the intervals and pumped into the zones to clean the formation. Production 1½ months after treatment was 112 BOPD and 238 BWPD.

*FOR CAPABILITY WHEN IT COUNTS . . . CALL HALLIBURTON!*

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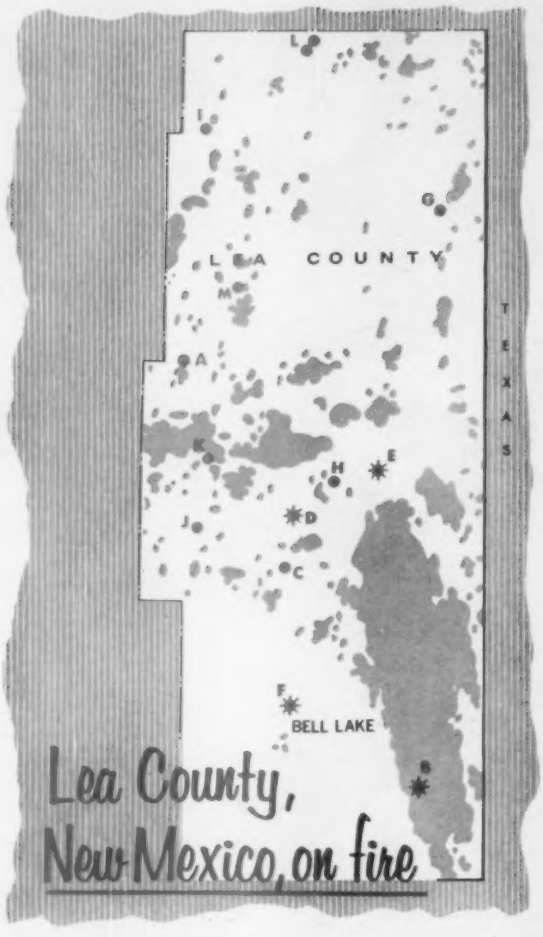


**ONE** of the nation's busiest drilling centers today. Each letter tabs a significant recent discovery. See tabulation.

## Recent important discoveries in Lea County

| On Map | Well Name and Location | | Reservoir | Depth | Potential |
|---|---|---|---|---|---|
| A—Union 1-33 | Union State | 113-15s-32e | Wolfcamp | 9,952 | 1,224 bbl. |
| B—Shell 1-36 | State "B" | 36-24s-36e | Ellenburger | 12,800 | 61,500 M.c.f. |
| C—Ohio 1 Lea | Unit | 12-20s-34e | Devonian | 14,400 | 516 bbl. |
| D—Ohio 1 | State-NPA | 6-19s-35e | Bend | 13,033 | 3,750 M.c.f. |
| E—Aztec 1-AJ | State | 1-18s-36e | Queen | 4,462 | 21,000 M.c.f. |
| F—Continental 6 | Bell Lake | 6-23s-34e | Devonian | 14,568 | 30,500 M.c.f. |
| G—Max Pray | 1 Craig | 27-12s-37e | Devonian | 12,304 | 432 bbl. |
| H—J. M. Kelly | 1-SS Federal | 24-18s-35e | Devonian | 12,180 | 360 bbl. |
| I—Austral Oil Co. | 1 State | 33-10s-32e | Pennsylvanian | 8,750 & 10,156 | Drilling |
| J—Pan American | 1 W. Tonto | 18-19s-33e | Morrow | 13,325 | 2,030 M.c.f. |
| W. A. & E. R. Hudson 1-18 | Federal | 18-19s-33e | Seven Rivers | 3,259 | 648 bbl. |
| K—J. P. Dunigan | 1 Denius | 33-17s-33e | Abo Reef | 8,170 | 502 bbl. |
| L—Sun Oil Co. | 1 McNulty | 3- 9s-34e | Permo-Penn | 9,604 | 207 bbl. |
| M—J. G. Brown et al. | 1 Lion-State | 9-14s-33e | Pennsylvanian | 9,954 | 261 bbl. |

# New strikes pop up all over Lea County

BY FRANK J. GARDNER

LEA COUNTY, New Mexico, with 13 significant discoveries this year, has shoved aside all challengers as Permian basin champ. In total activity, it has outstripped even Andrews County, Texas, long the leader in that field.

**Various kinds of finds . . .** Some of the new Lea County rewards have come from rank wildcatting, some from extensions of older fields, and some from discovery of new pays in old areas, but they have been stimulating enough to boost drilling activity to new highs.

Latest in the series of new finds is Union Oil Co. of California 1-33 Union State (A on map). This 13,502-ft. wildcat has just been finished as a 1,224-bbl. oil producer from Wolfcamp-Permian pay at 9,952-80 ft.; potential was taken through 30/64-in. choke. Lying in Section 33-15s-32e, is spots 1½ miles north of nearest previous production in the multi-pay Anderson Ranch field. Union plugged back to 10,227 ft. to effect the completion.

At B on the map is an important new-pay strike in the old Jalmat Permian field. Shell Oil Co. has added Ellenburger production here with its 1-36 State "B" discovery, a gas well with calculated absolute open flow of 61,500 M.c.f. per day plus 8.6 bbl. of condensate per million. The reservoir lies at 12,800 ft. Total depth is 12,966 ft., plugged back to 12,926 ft. Location spots in Section 36-24s-36e.

At C lies yet another recent discovery of importance. This is Ohio Oil Co. 1 Lea Unit, in Section 12-20s-34e, an oil strike. This one went to total depth 14,735 ft., plugged back to 14,686 ft., and completed in Devonian perforations at the 14,400-ft. level for 516 bbl. of 55.7° oil per day through 8/64-in. choke.

To the south, at F on the map, is yet another highly important successful wildcat. This is Continental Oil Co. 6 Bell Lake Unit, Section 6-23s-34e. It's a Devonian gasser at 14,568-14,829 ft., with calculated absolute open flow of 30,500 M.c.f. per day plus 36 bbl. of 53.1° condensate. The operator carried this well to 16,506 ft. before plugging back to 14,900 ft. for completion. The new producer lies 4 miles north of Bell Lake field, where New Mexico's deepest production comes from Devonian at 15,000 ft. These two producing areas lie on the Delaware basin's northeastern flank.

**Indicate lots yet to be done . . .** There's not enough space here to go into detail on all the 13 discoveries spotted on the map. A brief tabulation of them is included. But the four strikes mentioned above are illustrative of the diversity of ownership, the choice of reservoirs, and the wide geographic spread that characterize the Lea County play today.

More important, they point up the fact that there's plenty of oil hunting yet to be done in such old oil and gas provinces as this.

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Bethlehem heads are available in diameters up to 144 in. They are made in thicknesses from 14 gage to 2½ in. Bethlehem also produces standard manhole and hand-hole saddles, covers and fittings, and also heads with flued openings. A number of sizes of ASME Code flanged-and-dished heads are stocked for prompt delivery.

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**BUILDING** the Wind River Trail through the frozen Yukon to location of Amerada Petroleum Corp. 1 YT-A was one of the most unusual projects ever undertaken in the Arctic.

# Drilling takes special methods and special planning north of the Arctic Circle

Pictures and information courtesy the Ohio Oil Co. Beacon.

**MUCH** of the geological work for the Yukon operation was done by plane and helicopter. Geological surveys began in late spring 1959.

LAST FEBRUARY the northernmost well on the North American Continent was spudded in at Amerada Petroleum Corp. 1 YT-A, some 60 miles north of the Arctic Circle in the Yukon Territory of Canada. This northernmost wildcat now has a distance competitor at 1 Point Separation, a Richfield Oil Corp. et al. test to the northeast.

Point Separation is 90 miles northwest of the Grandview Hills dry hole and 135 miles northeast of Western Minerals et al. 1 Chance, first producer in the Yukon. Location of Richfield's new test is 67° 34′ 06″ N Lat., and 134° 10″ W. Long. Immediate drilling is slated with Peter Bawden Drilling Co. doing the job. The rig is on its way to the well site by barge down the MacKenzie River.

**The YT-A story.** Drilling got under way last winter at Amerada's bush-country wildcat after a long period of careful and well-planned road-building and geological work.

The story of the 1 YT-A actually

began many months before. Ohio Oil Co., Amerada, and Hudson's Bay Oil & Gas Co., Ltd., had an agreement to support the well jointly, with Amerada as operator. Ohio's interest was 33⅓%. The well is located on the 864,898-acre Bell River block, one of the six in Canada's Yukon Territory in which Ohio has a consolidated acreage position of 2,797,045 acres.

**DR. SAM NEILSON** gives Gary Neilson a haircut, Yukon style. These men are geologists for Bullock Associates, geological consulting firm.

Last May an exploratory crew flew into the Far North bush country. With the group was Ohio Oil Co.'s C. R. Swanson, who recently transferred to Canada from Oasis Oil of Libya. Ohio Oil Co. geologist, Jack Redman, also went along. The mission was to conduct surface geological surveys and pick a site for the first test well. Also along on the trip were photogeological and paleontological consultants. According to Swanson, their work was hampered somewhat by the "vegetation, poor rock exposures, billions of mosquitoes, and inclement weather."

Despite nature's wrath, the job was finished in one season with the help of helicopters. The crew picked the Bell anticlinal structure, located in the conifer-covered Richardson Mountain foothills, as the drilling site.

Then came the goliath task. With the drilling site picked, the next step was to move in some 3,000 tons of equipment and supplies to the location from as far as 2,000 miles away.

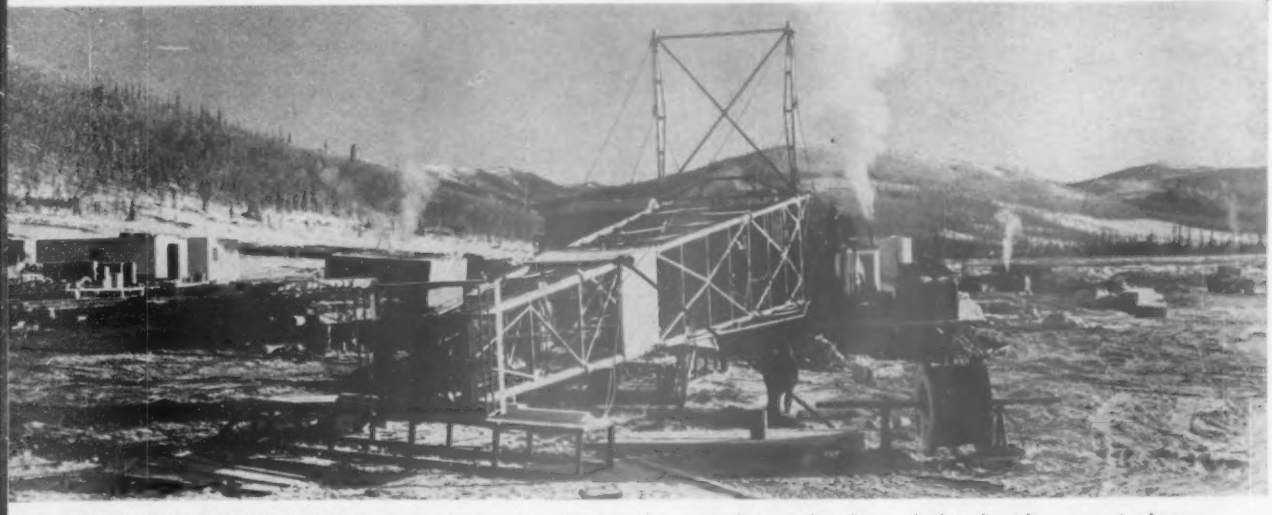
The first 1,600 miles to a staging area near Mayo in the Yukon would be relatively easy: move a 500-ton drilling rig and 6,000 ft. of drill pipe up the Alaska Highway from Edmonton to Mayo, a trip of 1,650 miles; send the mud, drill collars, cement, bunk houses, etc., by ship from Vancouver on the Pacific to Skagway in Alaska, then over the White Pass railroad to Whitehorse, thence by truck to the staging area. But from Mayo to location 385 miles north, not even a trail marked the wilderness.

**... Cat trains.** The normal means of transportation over this terrain is by cat trains—a series of heavy snow-going vehicles pulled by tractors. A local trucker at Mayo suggested instead that a road be built and ordinary highway vehicles used. This had never been done before, but if it could be accomplished, a huge savings of 26 cents per ton-mile would result.

**GEOLOGIST** Jack Redmond takes time out to bag a local inhabitant.

A new firm was organized for the highway-building job. The trail would have to be dozed out of the rugged country, through mountains, muskeg, and rivers. The roadbed would have to be made of gravel, compacted snow, and overburden of vegetation and moss. Several ice bridges would be necessary. The big job was to get this road completed in time to move in supplies for at least 6 months. If spring thaw hit, the road would be out of the picture completely.

This road is one of the biggest achievements yet in the Far North. The route, called Wind River Trail,



**COMPLETION** of the Wind River Trail was in January. First trucks arrived immediately, and the derrick was raised on February 19 to beat the deadline.

## ...in difficult areas

On the surface, tellurometers accurate to within inches over a fifty-mile traverse are visible indicators of GSI's new look at refraction shooting.

Looking deeper, recently developed refraction interpretation techniques, special refraction instruments and seismometers are giving GSI clients subsurface data in areas where it was unobtainable in the past.

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was mapped out from the air. It began at Thompson Creek, wound past McQuesten Lake, over Braine Pass, up Wind River, across the Little Wind, along Hungry Lake, over the Peel and along Eagle River to the location, 100 miles below the Arctic Ocean.

Construction began last October. Henry Kabanak and Frenchy Lavoie, dozer operators, hacked out the trail which averaged a surprising 5 miles per day.

**Arrival.** On January 11 the dozers reached Bell River. Right behind were the bright yellow and green tractor-trailers of the White Pass and Yukon Route with the first supplies and equipment. A comfortable camp was set up immediately. It included a dining hall, kitchen, utility rooms with showers, automatic washers and driers, recreation room, workshop, lighting plant, storerooms, and offices.

The derrick was raised February 19.

## Palo Pinto is new pay for North Texas area

Cree Oil & Exploration Co. and White & Bragg 3 J. P. McCord opened new Palo Pinto production in northwestern Coleman County, Texas. The discovery is 4 miles northwest of Glen Cover in Regular field.

The well flowed 35 bbl. of oil from perforations at 3,502-18 ft. on 20/64-in. choke. The well opens Palo Pinto pay in Ralston Bragg Northwest Gardner and Gray areas, but the operators want it included in regular field pay rather than requesting discovery status. Location is in the McCord and Lindley Survey, 18.

## Caddo production reported in North Texas area

Wanda Caddo field was opened at W. A. Lofton 1 Petrex Oil Corp. "Lee," northwestern Archer County, Texas.

The discovery, 7 miles south of Mankins, flowed 240 bbl. of oil on 8/64-in. choke from Caddo perforations at 4,901-11 ft. Location is in SPRR Survey 5, A-412. Nearest oil is ½ mile northeast in Regular field.

## Oil flows at new Green River discovery

Wyoming's Mickelson Creek unit has an oil producer at Raymond I. Smith 2 Unit in SW NW 29-32n-114w, Sublette County.

The well flowed oil at the hourly rate of 20 bbl. during tests of Mesaverde at 3,536-49 ft. Nearest production is at the north side of Big Piney field, 14 miles southeast.

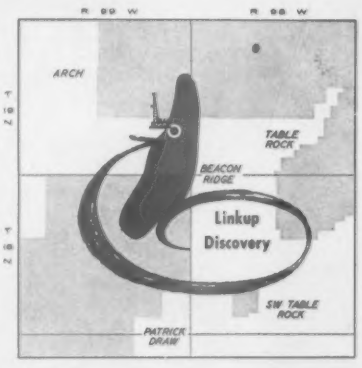
# Wyoming units are linked

A LONG-EXPECTED linkup of Wyoming's Patrick Draw and Arch units in Sweetwater County is now official. Texaco Inc. completed 2 Beacon Ridge Unit in C SE NE 25-19n-99w for 765 bbl. of oil daily through 8/64-in. choke from Almond Cretaceous sand. This links up the Almond production at the south end of Arch unit to the Almond oil at the north end of Patrick Draw unit.

The 1 Beacon Ridge Unit flowed 310 bbl. of oil per day on 42/64-in. choke. Texaco is doing the drilling on the Beacon Ridge unit. It has four locations on the block . . . two in Section 25 and two in Section 35-19n-99w.

**Arch unit stepouts.** Forest Oil Corp. and Union Pacific Railroad are busy stepping out on the north side of Arch unit.

They completed 6 Arch unit in C SE SE 13-19n-99w for 684 bbl. per day on 32/64-in. choke. This well is 6 miles north of the southwesternmost location in the entire field, Gulf 1 Patrick Draw unit in SE NE 16-18n-99w. Forest has set pipe at 7 Arch unit in C NW SW 18-19n-98w.




**WYOMING'S** prolific Patrick Draw unit has officially joined in with its neighboring Arch unit on the north. Link up well is Texaco Inc. 2 Beacon Ridge Unit.

This area was tapped for production last year by El Paso Natural Gas Products Co. Since then 33 oil wells have been completed and 24 locations are busy now. There have been only three dry holes—all on the east side. It has consistently been one of the nation's busiest oil arenas this year.

## Gas play gives new life to California's Sacramento Valley

HOTTEST exploratory news in California is the gas play going on in the Sacramento Valley, one of the state's old producing areas that is enjoying new life these days.

Of special significance was the recent 33,020-M.c.f.d. discovery stepout in Sutter County's Grimes field by Cameron Oil Co. and Franco Western Oil Co. Six separate pays, all stratigraphic pinchouts, were found here.

**Yolo County.** To the south of Sutter County in Yolo County, Artnell Co. and Universal Consolidated Oil Co. have also come up with a deeper pool discovery.

The 1 Universal-Richey et al. in Section 35-11n-1w flowed at the rate of 2,250 M.c.f.d. through a ⅞-in. choke from 8,077-97 ft. However, the operator is going to overlook the deeper zone for the present and concentrate on the upper Du Bois sand, which came in for a strong flow during a water-shutoff test. Gas flowed through four ½-in. perforating holes at an estimated 4,000 M.c.f.d. Perforations were made at 3,040 ft.

The 1 Universal-Richey is about 1 mile southeast of the limits of Dunnigan Hills gas field. Universal Consolidated and Artnell each own half of the well.

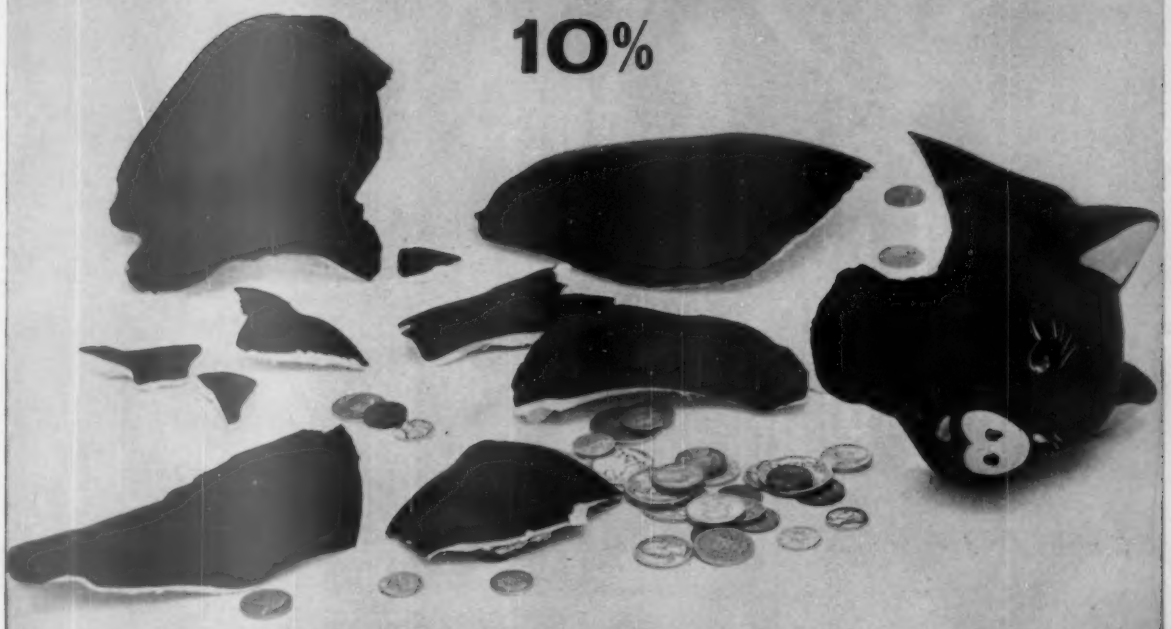
A drilling program to develop the Du Bois sand is planned by Artnell. The development program will be a joint effort with Universal Consolidated, Standard Oil Co. of California, and Richfield Oil Co.

**Tehama County.** In the northern part of the Valley, W. S. Payne, Jr., is preparing to drill another well, 1 Junkin, in Section 5-23n-3w, after apparently having a show in his first offset to the Kirkwood field discovery well.

The offset, 3 James W. Morgan, is 4,000 ft. west northwest of the discovery, which was completed in May. Payne is preparing to complete the offset after having set 4½-in. casing to 3,207 ft. The 3 Morgan is in Section 8-23n-3w and is the first successful follow-up of the discovery well.

Occidental Petroleum Corp., one of the more active companies in the Sacramento gas play, has staked location for a wildcat in Section 23-26n-5w about 1 mile southwest of a well which

# Would you spend an extra 10%



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**lasts from 2 to 5 times longer . . .**

**costs only 10 per cent more than ordinary roller chain!**

Yes, now by paying just a slight premium you can buy Morse H-E (high endurance) roller chain . . . and get 2 to 5 times the service life over ordinary chain. You'll save thousands of dollars annually on tough drilling jobs. Here's why:

Normal roller chain breaks under heavy strain in oil-field applications. It's this "tired metal" problem that plagues anyone who has used roller chain. Morse has developed a process to overcome metal fatigue. As a result, Morse H-E Roller Chain has a 95% greater endurance limit . . . lasts up to 500% longer . . . costs just 10% more.

Morse H-E Roller Chain is available from 1" through 2½" pitch, standard and heavy series, single and multiple widths. Make a test on your own rig. Your local supply store is the place to start. Or write: Morse Chain Company, Dept. 22-80, Ithaca, N.Y. Warehouses in Houston and Los Angeles. Export Sales: Borg-Warner Intl., Chicago 3, Ill. In Canada: Morse Chain of Canada, Ltd., Simcoe, Ont.

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had unconfirmed oil and gas shows before being abandoned last March.

**Other tests.** Two other wildcats have been staked in the valley.

Reserve Oil & Gas Co. plans to drill a wildcat in the Liberty Cut area of Solano County. The company's Liberty Farms-Reynolds 1 in Section 19-5n-3e will be about 2½ miles southwest of Liberty Cut gas production and about 3 miles southeast of Maine Prairie gas field.

In Sacramento County, Amerada Petroleum Corp. has moved about 3 miles northwest of Walnut Grove gas field to stake location for its 1 Garin Gas Unit. The Amerada wildcat is in Section 29-5n-4e.

## Kansas nails down important gas, oil discovery

An important oil and gas discovery has been made by United Producing Co., the oil and gas subsidiary of United Carbon of Houston, with a dual completion of well 1 Walton, Haskell County, Kansas.

The well has been completed as an oil producer flowing 342 and 175 bbl. per day from the Morrow and Chester horizons.

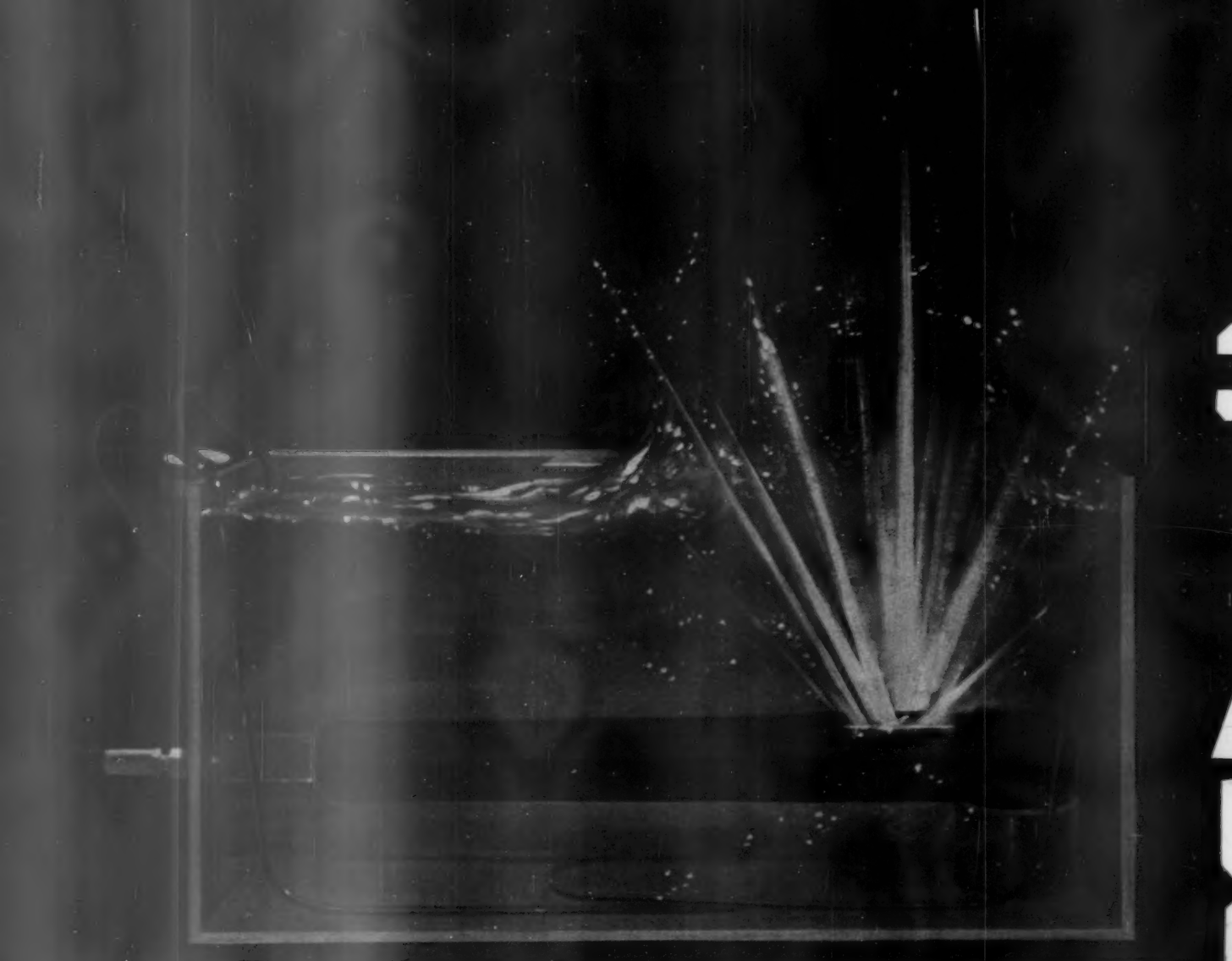
The well should have a total allowable of 130 bbl. daily. A confirmation well is drilling ahead at 2,112 ft. on United's 86,000-acre lease block.

The two Morrow pays totaled about 21 ft. in thickness, but the most important section was the Chester with an over-all thickness of some 60 ft. being saturated. Tests made while drilling indicate that the upper portion of this latter pay may be gas saturated.

The closest Morrow and Chester production is 5 miles north and 2½ miles south of the well, and there is no close development east or west of the location. With United owning all of the intervening acreage, the well was drilled as a result of a detailed seismic survey below the regular Hugoton pays.

## Gas producer in eastern Kentucky

In south central Lawrence County, eastern Kentucky, Blaine Quadrangle, Kentucky West Virginia Gas Co. has completed its 1124 Moore for an initial open-flow gas producer of 301 M.c.f.d. Production comes from two horizons, the Berea sand and the Corniferous lime. Total depth of well was 2,735 ft.



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### OPERATOR NETS $4715 IN 90 DAYS FROM ABRASIJET AND ACIDIZING BY DOWELL

ALBERTA, CANADA. Three old wells in the Redwater pool produced an *extra* 4520 barrels of oil in 90 days as a result of Abrasijet*—Dowell's abrasive jetting service—and Dowell acidizing treatments. After deducting total workover and treatment costs from added revenue of $10,115, a net profit of $4715 was realized.

### DOWELL SAVES GAS WELL— GETS 10-DAY PAYOUT

SOUTH TEXAS. A Dowell frac job made a 2,750 mcfd producer out of an old Frio well that was practically dead and non-commercial. Payout on treatment was estimated at 10 days.

### DOWELL FRAC JOB BRINGS NEW LIFE TO 40-YEAR-OLD GAS WELL

WEST VIRGINIA. 850 mcfd open flow and 200 mcfd delivered into line resulted when Dowell fractured a practically dead 40-year-old gas well. Treatment cost was paid out in less than 30 days.

### TREATMENTS WITH VERSENE 100 GIVE 35-DAY PAYOUTS IN PERMIAN BASIN

WEST TEXAS. Average payout of ten treatments by Dowell using Versene® 100 was 35 days. Versene 100 is a chemical used to remove calcium sulfate, calcium carbonate and other scales from wells. Average production increase was 9.7 bopd and treatment costs were between $550 and $875. Net value of oil was assumed to be $2.00 per barrel.

# WITH DOWELL WORKOVER TREATMENTS

### DOWELL USES "ACID GUIDE"* TO GET FAST PAYOUT ON THREE PROBLEM WELLS

NORTH DAKOTA. Payouts of 55, 23 and 65 days were realized from treatments with Retarded Acid of three old wells in the Madison lime of McKenzie County. Previous treatments using regular acid in the same field had failed to pay out.

### NEW ACID TREATMENT SAVES OPERATOR ABOUT $400 PER MONTH ON WATER DISPOSAL WELL

SOUTHEASTERN NEW MEXICO. A single $735 treatment replaced three $650 monthly treatments on a Lea County disposal well. By substituting Stabilized Acid and a surfactant wash for regular acid, life of the job was tripled at an extra cost of only $85. Savings averaged about $400 per month.

### FRAC JOB PROVIDES EXTRA GAS AT THREE CENTS PER THOUSAND

NORTH LOUISIANA. 105 mmcf of *extra* gas was produced in four years from a well in the Monroe Gas Field. Reason for this extra production was a Dowell frac job performed in March, 1956. Based on treatment price, the extra gas cost the operator three cents per thousand. 39 similar wells fractured early this year promise to be at least as profitable as the 1956 job.

Talk over your workover problems with your Dowell representative. He will show you how Dowell can use new ideas and techniques to help you cut costs and increase revenue. Dowell services and products are offered from more than 150 offices and stations in the United States, Canada, Venezuela, Argentina and Germany. Dowell, Tulsa 1, Oklahoma.

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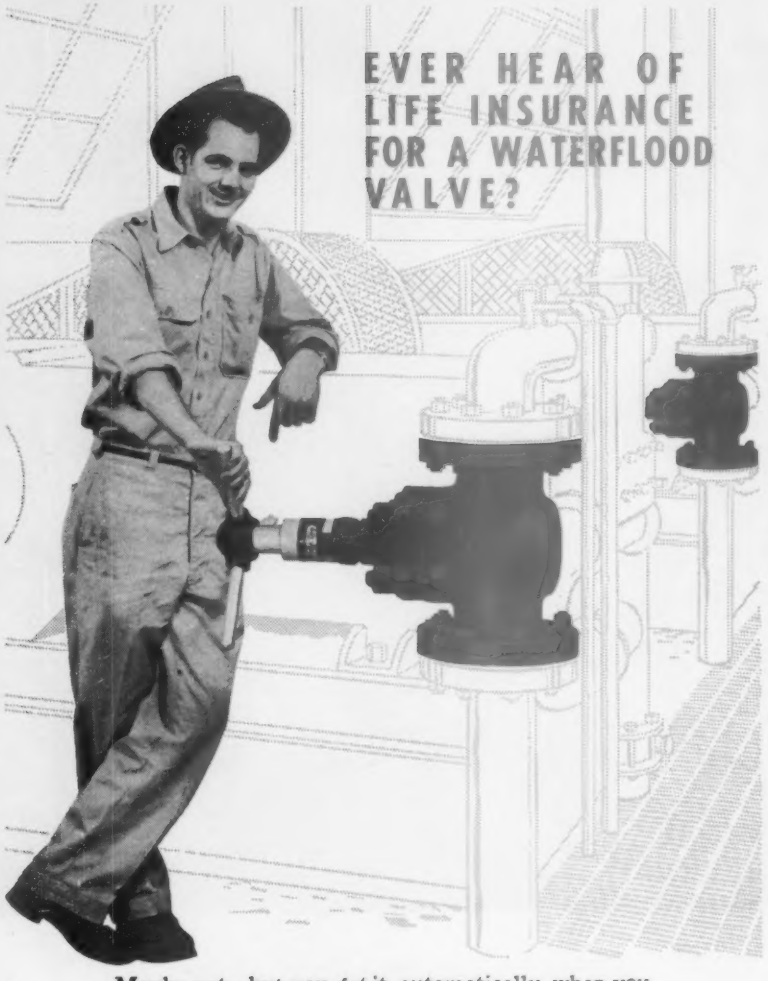


Maybe not—but you *get* it, automatically, when you specify the Demco Valve for waterflood operations! Because Demco's unique design and construction give you *built-in insurance* for longer, troublefree valve life against the highly-corrosive qualities of salt waterflooding. With Demco's high-pressure gate valve, you get a positive rubber-to-metal seal—tough synthetic rubber against corrosion-resistant stainless, Monel, aluminum bronze or ductile iron.

And the Demco Valve seals drop-tight without applying undue torque to the stem! The body remains in line while the entire inner assembly lifts out for easier, faster inspection. Fewer parts are subject to wear. Design allows constant self-lubrication of stem threads, protection from abrasives by *double* stem seal.

Countless troublefree installations have proved this versatile valve's rugged performance under the most difficult waterflood conditions. Why not let the Demco Valve's "life insurance" work for you, too?

**Available at supply stores everywhere in 1,000, 2,000, 3,000 and 5,000 psi working pressures . . . in two-to four-inch sizes.**

**DRILLING EQUIPMENT MANUFACTURING CO.**

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DEMCO

## Second survey set for South Australia

A party of oil geologists has begun a second survey of the Officer basin in the Woomera area of South Australia, which has never been thoroughly explored by anyone.

This was announced by Exoil Pty., Ltd., exploration subsidiary of Oil Drilling & Exploration, Ltd., which is making the survey.

The area in which the party is working is in the northernmost part of the 197,000 sq. miles of Exoil exploration leases in South Australia and western Australia.

ODE made a preliminary geological survey there in 1959.

## Petroleum Sourcebook is published

The 1959 edition of the annual Petroleum Sourcebook has just been published by National Bibliography, Box 3586, Amarillo, Tex.

A worldwide directory of information sources classified by country, region, and state or province, the 234-page book lists the 1958 references to petroleum literature from the trade press, as well as publications of professional societies, state and federal agencies, and mapping, statistical and financial institutions. More than 5,000 references are compiled from approximately 1,500 publications.

Designed to serve as a desktop information service, the book has been widely accepted as a basic reference, copies sold in 54 countries last year.

## Allowable hearings for Scipio slated

Gerald Eddy, state oil supervisor, has set August 18 for public hearing to again review production allowables for pools on the Scipio trend in southern Michigan.

Production and spacing will be reviewed in the Wayland, McBain, and Ira pools at the same time.

Only revision in Scipio allowables since the play started in 1957 was made as of June 1 this year in a cutback from 150 bbl. per well per day to 125 bbl. Gordon Hautau, state proration engineer, has recommended 100-bbl. per day maximum at the two major hearings on the field.

Figures just released for the Scipio area credited the field, now developed over 30 miles, with crude runs of 585,436 bbl. in June from 211 wells. This compared to 647,948 bbl. in May, last month of 150 bbl. per well allowables.

usi Axelson **PUMPING NEWS**

# Multiple Completions Up 65% Axelson Expands Special Products

## 2-ZONE PUMPS

### TWO-PACKER SINGLE STRING

Cross-Over Assembly

*Least expensive for dual zone completions*

### SINGLE-PACKER DOUBLE-STRING

Clamped Tubing Cross-Over and Stab Joint Cross-Over Assembly

*Most widely-used Axelson Two-Zone Pump, allows treating or gas venting the upper zone*

### ONE-PACKER TRIPLE STRING

Clamped Tubing Cross-Over

*Used where the lower zone presents gas or corrosion problems. Both zones may be vented or treated.*

As early as 1953 Axelson had a well-established Two-Zone Service Department when Texas was averaging less than 300 multiple completions per year. Now, with multiple completions up 65% over 1958, and running as high as 2200 per year in Texas, Axelson continues to expand its staff of full-time field specialists and engineers to handle the upswing of this type of completion.

Much has changed. Completions that once presented problems and seemed impractical are now considered routine due to Axelson's experience and advanced engineering design. Past complexities have been simplified and Axelson's know-how, specialized equipment and experience are available to all. Axelson's Two-Zone Department, now called Special Products Department, covers every multiple zone producing field in the United States and deals with both new completions and existing installations. They are also available to make recommendations on triple completions and slim hole duals or any phase of special multiple completion engineering.

Although their primary function is designing setups for multiple zone completions to take advantage of the production economies afforded by Axelson Two-Zone Pumps, Axelson experts work out production problems and make recommendations where one zone may be producing gas and the other oil, or where one zone is flowing and the other is pumping.

**Axelson Two-Zone Pumps** provide a practical, economical method of producing from two zones at once without commingling the fluids. Only one surface pumping unit is required, with a single rod string. All pump parts, with the exception of the cross-over assemblies, are standard, field proved parts, and the Two-Zone Pump itself is an insert-type pump, completely retrievable. A metal-to-metal seal is used for long life and dependability.

While the pumps themselves might be termed standard units, no multiple-zone completion can be called standard. No two wells present the same conditions, so each Axelson dual zone installation is in effect custom designed.

When an Axelson two-zone specialist is called in to discuss a multiple zone installation, he takes into account: pump depth (for both zones), casing size and length, tubing, water cut, gravity of the oil, desired production and the gas/oil ratio. The surface pumping unit—peak load and torque ratings, stroke length and maximum cycle, size—also enters the calculations, as well as such special conditions as sand, viscous fluid, and corrosion. He can also recommend the best tubing string design, the prime mover, surface pumping unit, packer type and rod string.

When the installation is made, he will supervise it at no extra charge—set the pumps and packers, and be on hand for the initial pump running—to make sure you have an efficient, economical production setup.

Call in your Axelson specialist and let him work with you in engineering your multiple zone installations. If you are contemplating a multiple zone flowing well, the Axelson specialist can install the correct cross-over now—and you won't have to pull tubing when you run the two-zone pump later!

Write the Special Products Department, Axelson Div. of U. S. Industries, 6160 S. Boyle Ave., Los Angeles 58, Calif.

**SPECIAL NOTICE**

**For deep and/or high volume two-zone production Axelson announces a new special two-zone pump to run under a 26-ft. hydraulic pumping unit. Write for more information on this type of installation.**

## *Write, Today, for New Facts*

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- ☐ Two-Zone Pump
- ☐ High Volume Casing Pump
- ☐ Long Stroke 2-Zone Pump

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EXPLORATION OUTLOOK

# Sooner eyes focusing on Arkoma basin

ARKOMA BASIN, one of the Mid-Continent's exploratory stepchildren for half a century is now a sure candidate for gas-producing leadership. This basin and its southern neighbor, the Ouachita Mountains, are fast overtaking the Anadarko basin as Oklahoma's most closely-watched petroleum province. Two recent wildcat discoveries in Latimer County, both resulting in major gas reserves and geological importance, have given Arkoma what every untested basin needs . . . exploratory incentive.

### Gas production is not new

. . . in the Arkoma basin. Gas has been produced in the McAlester area at the west side of the basin for half a century. Most of the production is from Hartshorne Pennsylvanian rocks ranging in depths from 500 to 3,500 ft. Many shallow gas fields dot the basin, all associated with the myriad anticlines that wind through the highly complex province eastward into Arkansas. Some of these fields produced large quantities of gas in the 'teens, 20's and 30's. Interest lagged, however, in the search for production in the thick and deep sediments of Atokan and Morrowan Pennsylvanian age.

### The deep drilling isn't new either

. . . in southeastern Oklahoma. The first important deep gas discovery in the region was in 1930 at Red Bank Oil Co. 1 Fee in LeFlore County. This Milton anticline wildcat found 5,500 M.c.f.d. at 5,403-21 ft. in the Spiro or basal Atokan sand.

Many years passed until West Milton field was opened in 1958. This discovery of Spiro gas added more reason for looking into the deep gas potential of an almost forgotten gas province.

Superior Oil Co. proved that there were major gas reserves lying in wait for those who hunted with the completion of 1 Allred in Haskell County's Northwest Kinta area. This operator found 30 M.M.c.f.d. in Morrow sand at 5,600 to 6,100 ft. But even with the significant and promising gas discoveries of those years interest failed to materialize.

### A deep test taps Brazil anticline

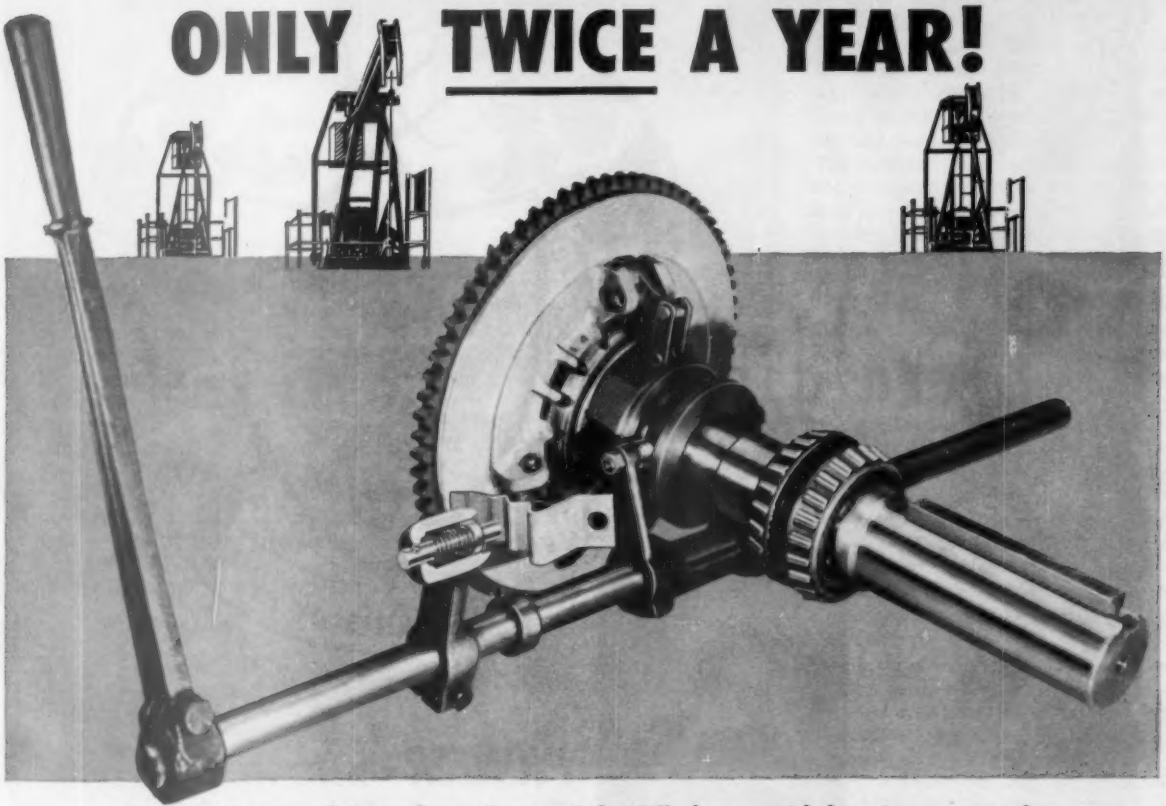
. . . ending the long period of sleep for Arkoma. Last year Midwest Oil Corp. drilled 1 Orr on the Brazil anticline in Latimer County inside old shallow Red Oak-Norris field. This important wildcat went to 12,650 ft. into the Mississippian. Two gas pays were found in the Atoka. One zone at 7,180-7,335 ft. got 20 M.M.c.f.d.; the other got 17,800 M.c.f.d. This well caused a flurry of leasing and exploratory activity throughout southeastern Oklahoma.

The other wildcat that pushed Arkoma on its way to gasdom is Sinclair Oil & Gas Co. 1 Reneau, south of the Choctaw fault in the Ouachita Mountains. The Potato Hills structure test got 1,850 M.c.f.d. from Big Fork or Viola Ordovician at 2,340-2,410 ft. This well brought production to the highly complex Ouachita Mountain province.

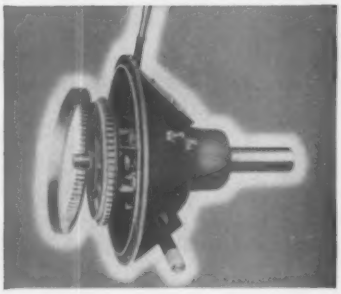
### And development spreads rapidly

. . . as both Apache Oil Corp. and Ambassador Oil Co. continue an aggressive drilling foray in the Kinta area. Apache 1 Howard flowed 6,950 M.c.f.d. from basal Atoka, and the 1 Wimberly flowed 8,200 M.c.f.d. Other operations in the area plus these two wells promise a linkup with Northwest Kinta field and Kinta field. Other discoveries include Knight's 1 Mathews in McIntosh County, and a reported gas find in Pushmataha County in the far southeast corner of the state's Ouachita province. All agree that Arkoma is here to stay as a gas objective. All agree that it won't be 50 years until gas production here becomes a major reality. —*John C. McCaslin*

# THIS PTO NEEDS GREASING ONLY TWICE A YEAR!



**Twin Disc Limited Attendance Power Take-Off shown with housing removed**



- **Designed especially for oilfield pumping service**
- **Eliminates throw-out collar wear**
- **Ends daily PTO greasing**
- **Greatly extends periods between maintenance**
- **Will pay for itself in labor savings alone**

Daily greasing of PTO clutch throw-out collars is not only a nuisance but, in cases where pumping jacks are widely-scattered, a heavy expense item as well. Twin Disc has solved this problem with a new clutch engagement mechanism that virtually eliminates throw-out collar wear, ending daily greasing for good.

Here's how it works: Two sealed cam followers ride in an annular groove machined into the sliding clutch sleeve. When the hand lever is pushed forward, the cam followers exert a forward thrust on the sliding sleeve. As the clutch linkage passes through top dead center, over-center action snaps the sliding sleeve slightly forward. At this instant, a contoured detent (bolted to the housing) checks the forward movement of the cam followers, assuring positive clearance.

There's no wear on the throw-out mechanism in the fully disengaged position because there's no contact between cam followers and sliding sleeve. Cam followers rotate *only* when the clutch is being engaged or disengaged.

In oilfield pumping service, the advantage of this design feature is obvious . . . instead of once a day, PTO greasing is needed only once every six months. The savings you realize in time and labor costs can easily amount to thousands of dollars a year.

The "limited attendance" clutch feature is available on Twin Disc 10″, 11″, 14″ and 18″ PTO's. Its small additional cost is insignificant compared to the savings it makes possible. Kits for converting your present Twin Disc PTO's are also available. Write to our Racine factory for full details.

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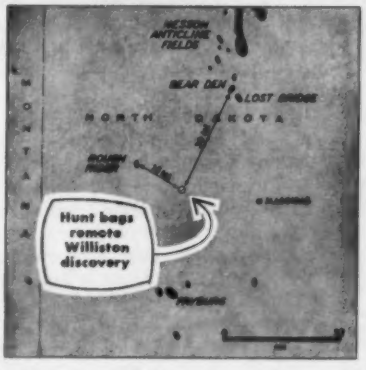
# North Dakota gets significant strike

WILLISTON has its first important discovery since the opening of Rough Rider field last year at a Hunt Oil Co. wildcat in the deep, central axial portion of the basin.

Hunt's 1 Haag in C NE NE 21-144n-99w, Billings County, North Dakota, recovered 1,669 ft. of very gassy free oil on a 4-hour drill-stem test at 9,910-52 ft. Pay zone is the Mississippian.

**Remotely located.** This may be the third important discovery for the deep central portion of the Williston basin.

Hunt's wildcat is 15 miles from Rough Rider field, 30 miles from Nesson anticline production, and right in the middle of a sparsely drilled and untested portion of the basin. There has been a small amount of drilling in a 30-mile radius of the well . . . no more than 10 wildcats, all failures except for the Rough Rider discovery. The other field in the axis part of Williston is far to the northwest at Dwyer in Sheridan County, Montana. This Hunt wildcat will be closely watched as a further clue for production in the undrilled vastness of Williston's central portion.




**THIRD DEEP FIELD** for the central portion of Williston basin may be in the making at a Billings County wildcat in North Dakota.

**ON THE RIG** of a new Tar Springs stepout discovery in Hopkins County, Kentucky, are: C. D. Ezell, Roscoe Jackson, and Walter E. Stegmier.

## Good Tar Springs well reported in Kentucky

In the Oak Hill section of southern Hopkins County, Kentucky, Mo Jo Oil Co. Inc., and Walter E. Stegmier are bringing a new well in on the Herbert E. Carroll farm.

This is a 1,000-ft. stepout to production. It found oil saturation in 12 ft. of the Tar Springs sand and 18 ft. in the lower Tar Springs. Total depth is 1,527 ft.

The well was drilled by C. D. Ezell Drilling Co. Operators think it will be one of the best Tar Springs wells in the area. Free oil was bailed.

## Athabasca break still in future

OIL PRODUCTION in commercial quantities from Alberta's fabulous Athabasca tar sands would appear to be about 2 to 3 years down the road. This calculated guess is based on submissions by three separate companies or groups of companies to the province's Oil and Gas Conservation Board, and could be fouled up like all estimates by an unforseen breakthrough in engineering. The oil is in the sands, between 200 and 300 billion barrels of it depending on various estimates. It has been extracted by numerous types of operations. It also is of a type that has many desirable refining properties. Thus none of these three factors is holding back development.

The holdup is an economic method of extraction; and a group that has spent over $9,000,000 on research in the area claims that further research into the actual field testing of equipment for the most economic method of extraction, as well as further investigation into markets for the products therefrom, will be required before commercial production is realized.

Operator for the research group, Cities Service Athabasca Inc., a unit operation of Cities Service, Imperial Oil Ltd., Richfield Oil Corp., and Royalite Oil Co., was intervenor at the recent hearing of Great Canadian Oil Sands, and tabbed the latter company's proposals as completely untested plans based too much on theory and not enough on actual working knowledge.

Great Canadian has plans that would cost an estimated $110 million and would result in production of about 35,000 bbl. per day by a mining and hot-water extraction method. The Alberta Conservation Board heard the company's submission in detail over a 5-day period in June and July and has reserved its recommendations for an unspecified period of time.

**High cost.** The high price tag on the Great Canadian Oil Sands operation could be a stumbling block, particularly in this time of short money supply, but it is certain that the government experts will not take the proposal too lightly.

However, their decision on its merits will in all likelihood be withheld until Cities Service Athabasca, and now Pan American Petroleum Corp., are crossexamined on their respective proposals. Hearings have been scheduled for mid-August by the board.

Cities Service Athabasca's production method, involving a mining operation, as well as closely guarded but believed to be chemical processes, was outlined in 1959. Pilot-plant operations have thus far cost about $9,000,000 and the group expects to pour another $6,000,000 into research before a number of most important questions are answered. It has, therefore, asked the board for the right to continue its testing, not on a commercial scale at present, but with a definite view to commercial production. The group expects its research program to be concluded within the next 2 to 3 years.

**In situ.** Pan American, meanwhile, has asked for permission to continue its in situ extraction method for a limited time, to gain further knowledge on this aspect of production. Its operation will be only experimental and not on a commercial basis, as production is not expected to exceed a few hundred barrels of oil. In its submission it requests that information filed with the board in the operation of this program be held confidential for a period of 3 years following termination of the project.

Richfield Oil Corp.'s highly publicized plans for the detonation of a nuclear blast in the base of the tar sands is presently smothered in government red tape and although sidetracked, this proposal is far from shelved.

Western Canada's oil-producing

companies that obtain their crude oil from the conventional hole in the ground will have their marketing problems for the next few years, but competition from tar-sands oil is not expected to be a serious threat.

## Four Lake Erie wells are gassers

SINCE the April beginning of drilling on Lake Erie by Consolidated West Petroleum, Ltd., four wells, the 42 and 43 on the west side of the company's development, 1 2 miles offshore, X8 about 8 miles from shore, and the MLO 27, 2½ miles east of production and 7 miles out on the lake, have been completed. These four wells went to the Salina and Guelph formations. All were successful gas producers, making a combined daily flow of 1,848 M.c.f. Maritimes activity.

In the Canadian Maritimes, two boats have been put into use by Mobil Oil of Canada, Ltd. The ships will conduct a 5-week marine seismic survey to map possible undersea structures favorable to the accumulation of oil and gas on Sable Island, 100 miles east of Halifax, Nova Scotia. If this survey finds anything pointing to the possibility of oil and gas, drilling would start next summer.

Imperial Oil leads in the search for oil in the Maritimes. The company has drilled wells on Nova Scotia, Prince Edward Island, and New Brunswick during the past 3 years. This year the company moved into the Dorchester area of New Brunswick. Drilling is going on there with New Brunswick Oilfields Ltd. Equipment was moved from Lake Ainslie in Cape Breton where two wildcats were drilled, the 1 Mabou (abandoned at 5,145 ft.), and the 1 Port, quit at 9,840 ft.

Two years ago Imperial abandoned three wells on Prince Edward Island. Two wells at Moncton were dry at 3,794 and 6,592 ft. Last year Imperial drilled a failure on Pollett River, using an air rig.

"Flolight" Generator Control Panels
"Floair" Forge Blowers
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THESE QUALITY-BUILT HUTCHISON PRODUCTS ARE AVAILABLE THROUGH SUPPLY STORES EVERYWHERE
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## Illinois basin activity centers in two states

Both Illinois and Indiana figured highly in last week's exploratory news in the tristate Illinois basin area.

Delbert Runyon is completing a wildcat in the McClosky lime at 2,646-51 ft. at 1 W. C. Frye in NW SW NW 2-2n-4e, 4 miles northeast of Iuka in Marion County, Illinois.

Recovery on a drill-stem test at 2,643-55 ft. was 490 ft. clean oil, 20 ft. of mud-mixed oil, no water.

In White County, Triangle Oil-J. E. Cassin 2 John Jacobs in NW NW SW 24-5s-8e flowed oil on tests of O'Hara lime at 3,186-90 ft. This indicated discovery is located 3 miles southeast of Enfield and 1 mile from similar production.

In Posey County, Indiana, 6 miles west of Evansville, Mayhew Oil Co. is installing pump for tests at 1 George Hast in SE SE SW 2-7s-12w for tests of the Biehl sand at 1,498-1,519 ft. The well swabbed and flowed 480 bbl. of oil and no water in 24 hours, natural.

In Spencer County, 4 miles west of Troy, Grant Mullenax and Hart & Hart are testing at 1 Walter Dunn in SW NE SW 5-6s-4w. The well pumped 30 bbl. of oil in 6 hours from Jackson sand at 725-735 ft.

## Ohio reports good gas completions

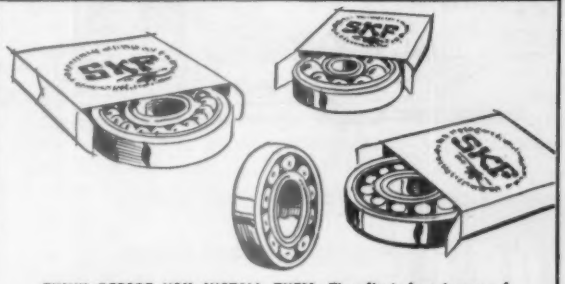
GOOD GASSERS are highlighting the current week's activities in Ohio.

Oil Well Drilling Co. reported its Crider offset, 1 R. Hyatt, Section 23, in southwest Richland Township, Holmes County, was shut in with a gage of 2,700 M.c.f.d. and 5 bbl. of oil after fracture. The Clinton sand

## DISTRIBUTOR DAN, the SKF bearing man, shows

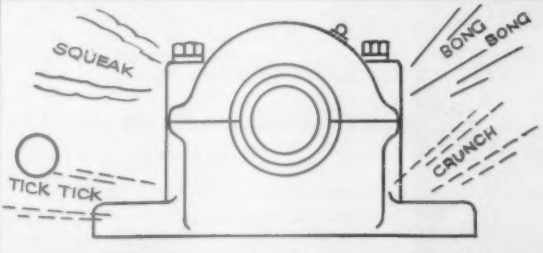
# HOW TO CHECK BEARINGS DURING RUN-IN

## —to prevent damage and downtime later!




**THINK BEFORE YOU INSTALL THEM.** The first few hours of operation are the most critical in a bearing's life. So, operate the bearing at reduced speed and load during run-in. Bearing run-in periods vary from a few hours to a few weeks, but 24 hours is usually sufficient.

**NOISE CAN BE A SYMPTOM.** A soft, purring sound is all you should hear from a bearing—if it's operating correctly. Check by placing the blade of a screwdriver and listening at the handle. Any other noise means trouble sooner or later.




**KNOW YOUR NOISES.** Squeaking means inadequate lubrication. Metallic tones indicate shaft or housing interference or improper adjustment. Smooth, clear tones tell of marks in the stationary raceway. Intermittent noises indicate a damaged ball. Crunching means dirt.

**TOO HOT TO HANDLE?** There's trouble brewing if the housing feels excessively hot. High temperature usually indicates overlubrication or use of a lubricant with too high viscosity. It can also be a sign of excessive axial or radial preloading, misalignment, tight-fitting seals, or rubbing.

**PREVENT TROUBLE BY DOUBLE-CHECKING.** Always check the bearing after the critical run-in period. Examine the lubricant. If it's dirty, change it. Check the seals for signs of wear or damage. A few minutes spent double-checking now eliminates chances of costly damage and downtime later.

**Baffled by a bearing problem? Whether it's selection, mounting or maintenance—consult your Authorized SKF Distributor. He's staffed to help you keep them running smoothly and he stocks all the bearing types and sizes you need.**

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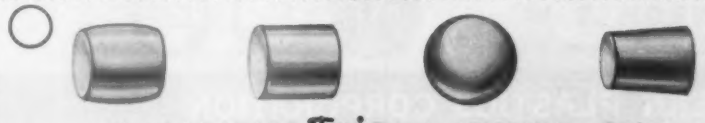

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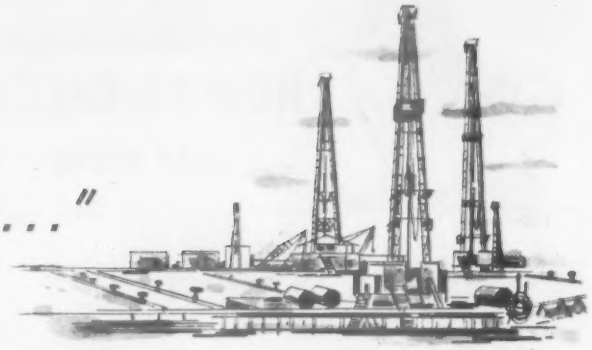
when they say:

## *"It's Easy as ABS..."*



Oilmen have a language all their own. Coined words and phrases wildcat all through the industry, and seem to move from slang to accepted usage in their dictionary overnight. The reason is that oilmen use words that say what they mean. That's why when they say something is "easy as ABS" they're talking about a permanent job that can be done quickly, effortlessly, and inexpensively.

Oilmen have learned that Western ABS semi-rigid plastic pipe is effortless to carry . . . quickly jointed, easily sawed, drilled or threaded, can be permanently solvent welded in seconds and the ready-to-use ABS pipe fittings require only the simplest tools.

They know, too, that ABS plastic pipe costs less to buy and costs less to install . . . and it has superior resistance to corrosion, chemicals and crude oil . . . will not rust or scale and is free from electrolytic action. Its smooth interior means lower friction, faster flow. It has both high impact and high tensile strength as well as high temperature resistance. Its high serviceability virtually eliminates the need for replacement.

As salt-water well tubing, as salt-water gathering and disposal lines, as oil flow lines . . . Western ABS semi-rigid plastic pipe is without equal in the oil fields.

## *It's as easy as ABS to use*

For further information write, wire or call

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was logged at 3,303-20 ft. and had 311 M.c.f.d. natural with a show of oil.

• In southwest Pike Township, Perry County, the second offset to Walsmith new pool discovery was shut in with 1,900 M.c.f.d. natural while still in the pay. Ridgedale Oil & Gas Co. 1 R. Stimmel, Section 30, rocked to 1,000 psi. in the Clinton sand from 3,319-47 ft.

• Two more successes in Swan Township, Vinton County, extend the Richland field east and north.

H. S. Bailey 1 Cora Neely, Section 23, gaged 2,420 M.c.f.d. 3 days after fracture with a rock pressure of 840 psi. D. W. Law 2 D. M. Beyer, Section 3, had 3,250 M.c.f.d. 1 week after fracture with a rock pressure of 852 psi.

• In northeastern Ohio another success has been reported in wildcatting activities in the general area.

J. E. Dinger et al. reported completion of H. & G. Blaney, Lot 25, Hartford Township, Trumbull County. This well found a show of gas in the Clinton sand from 4,868-75 ft. which finaled at 200 M.c.f.d. with 2 bbl. of oil after fracture. A 14-hour rock pressure was 625 psi.

## Oklahoma's Cedardale field moving to the east

A Major County well in northwestern Oklahoma is pushing the limits of Cedardale field 1 mile to the east. The pool is now separated from South Campbell field by only one open section.

Shell Oil Co. 1 Foster, C SE NW 21-22n-16w, flowed 2,820 M.c.f.d. during tests of the Mussellem Pennsylvanian from 6,260 to 6,335 ft. This field straddles the Woodward-Major county line, and since its discovery 3 years ago has steadily moved eastward into Major County.

## Hunton production seen in Dewey County, Oklahoma

Western Oklahoma's Dewey County, deep in the middle of the Anadarko basin, may get another Hunton Siluro-Devonian producer. Union Oil Co. of California found gas at the 1 Wilson in C NW SE 20-16n-17w, southeast of Putnam field.

A drill-stem test at 14,245-96 ft. got up to 3,310 M.c.f.d. Recovery was 1,260 ft. of gas-cut mud and 540 ft. of mud. It was at Putnam that the deepest Hunton producer anywhere was opened 2 years ago, stirring interest in the deep rocks of the basin.

**Blaine County.** Carter Division of Humble Oil & Refining Co. completed 1 Haworth in C NE SW 9-18n-10w as the fifth well in North Cooper field.

The Chester Mississippian well flowed 1,400 M.c.f.d. and 17 bbl. of condensate through ¾-in. choke from perforations at 7,720-60 and 7,830-48 ft. Open flow was 1,480 M.c.f.d.

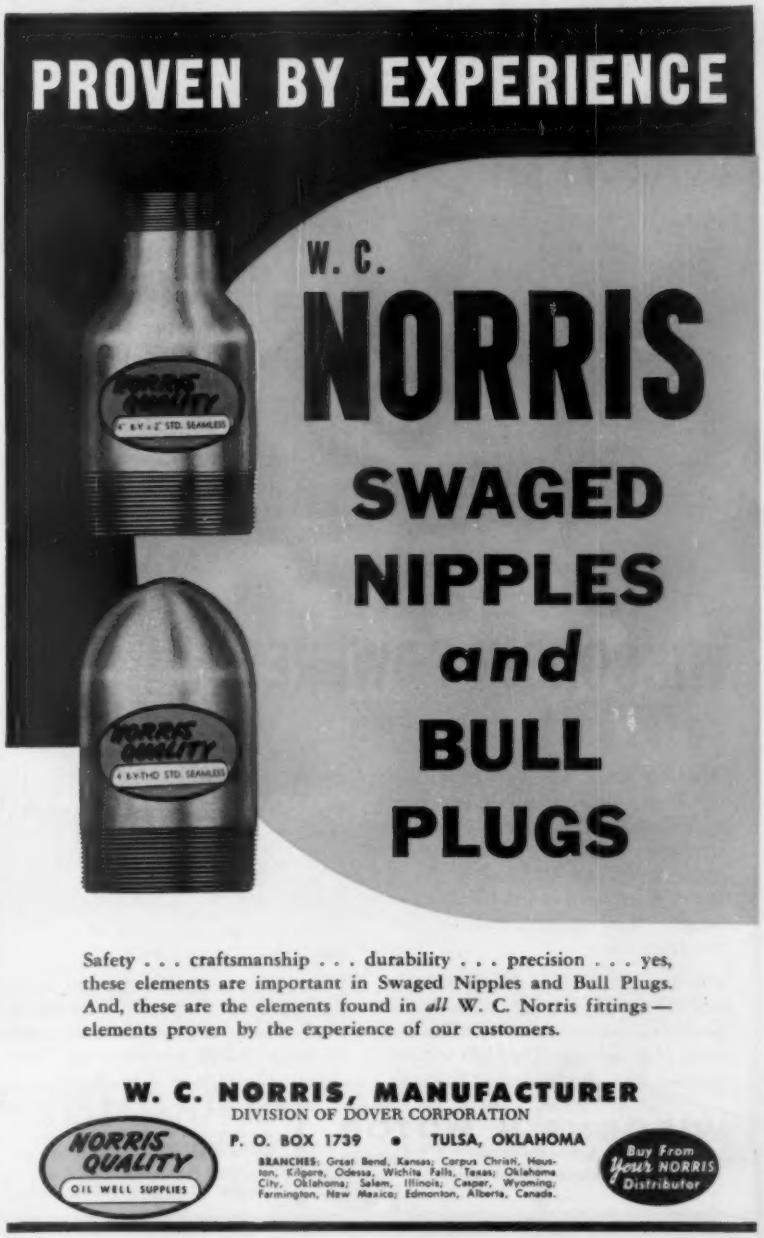
## Arkoma basin field adds fourth gas producer

Northwest Kinta field in Haskell County, southeastern Oklahoma, has its fourth gas producer. Apache Oil Corp. 1 Howard in C SW NE 22-8n-19e flowed 32,517 M.c.f.d., open flow, from basal Atoka Pennsylvanian perforations at 6,836-94 ft. Flow was through ½-in. choke.

## New Mexico's Lea County has prolific new trio

Three discoveries of major importance have been reported in southeastern New Mexico's Lea County in recent days.

Ohio Oil Co. 1 Lea Unit Federal in NW SW 12-20s-34e was completed flowing 516 bbl. of oil per day on 8/64-in. choke from Devonian per-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forations at 14,347-75 and 14,383-14,489 ft. This well has five other zones that showed for production during tests . . . Delaware sand, two zones in the Bone Spring, and upper and lower Bend. Location is 2 miles southwest of Pearl-Monument field.

Continental Oil Co. completed 6 Bell Lake Unit in SW SE 6-23s-34e, 18 miles south of Ohio's find. The well flowed 30,500 M.c.f.d. from perforations in the Devonian from 14,568 to 14,829 ft. This discovery is located on the east side of the Delaware basin.

Shell Oil Co. finaled 36-1 State-B in NE NW 26-24s-36e in the Jalmat area northwest of Jal for 61,500 M.c.f.d. on tests of what is believed to be the Ellenburger at 12,860-90 ft.

## Prolific Wolfcamp discovery flows oil in New Mexico

A flowing Wolfcamp discovery in Lea County, southeastern New Mexico, was completed for 1,224 bbl. of 40°-gravity oil daily on 30/64-in. choke. The big well is Union Oil Co. of California 1-33 Union State, a 13,502-ft. wildcat in the northwestern part of the county.

The well flowed from perforations at 9,952-80 ft. Location is in 33-15s-32e, 7 miles northeast of Maljamar, 5 miles west of South Saunders field, and 1½ miles north of Anderson Ranch Pennsylvanian field.

## Eleventh annual field trip announced by N. M. group

The eleventh annual field conference of the New Mexico Geological Society will be held October 14-16 this fall in the Chama basin region of northern New Mexico. Registration will be at Taos October 13. Advance inquiries should be addressed to Clay T. Smith, General Chairman, Campus Station, Socorro, N. M.

## South Louisiana has new gas-condensate hit

A new gas-condensate reservoir has been opened about 2½ miles northeast of Southeast Rayne field in Acadia Parish, South Louisiana.

Its discovery is by J. P. Owen, Preston Oil Co., and Alton Coats. Their discovery well, 1 Cleolinda Iseringhausen, in 36-9s-2e, flowed 1 M.M.c.f. of gas and 8.96 bbl. of 49°-gravity condensate per day for a potential gage.

Production is from sand perforated at 11,381-83 ft. in hole drilled to 12,438 ft. Flowing pressure is 3,900 psi.

## Louisiana fields are extended

Productive limits of two fields on opposite sides of South Louisiana's Allen Parish are being extended in successful stepout drilling being done by Hunt Oil Co.

Castor Creek field, on the east side, is being extended westward. Clear Creek field, on the west side, is getting a north extension on its east end.

Castor Creek's extension well, 1 Joseph Adams, is the fourth successful completion for the field, discovered in 1957 with gas and condensate production from a 9,500-ft. Cockfield sand.

The new producer is completed with pay perforated at 9,486-9,504 ft. It flowed 437 M.c.f. and 21.6 bbl. of 59°-gravity condensate per daily through 11/64-in. choke. Pressure registered 2,050 psi. Total depth is 9,650 ft.

The Clear Creek extension well, 1-C Crosby Chemicals, is ¾ mile from production. Although no gage productivity has been reported, it flowed pipeline oil from a 4-ft. interval in Cockfield sand at 8,750 ft. Shut-in pressure is 1,100 psi.

This field, discovered in 1953, is


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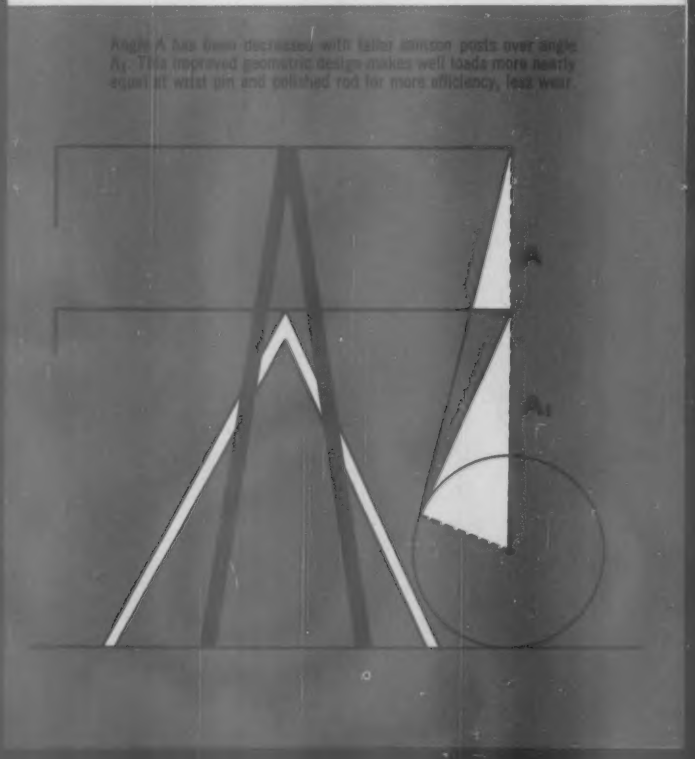

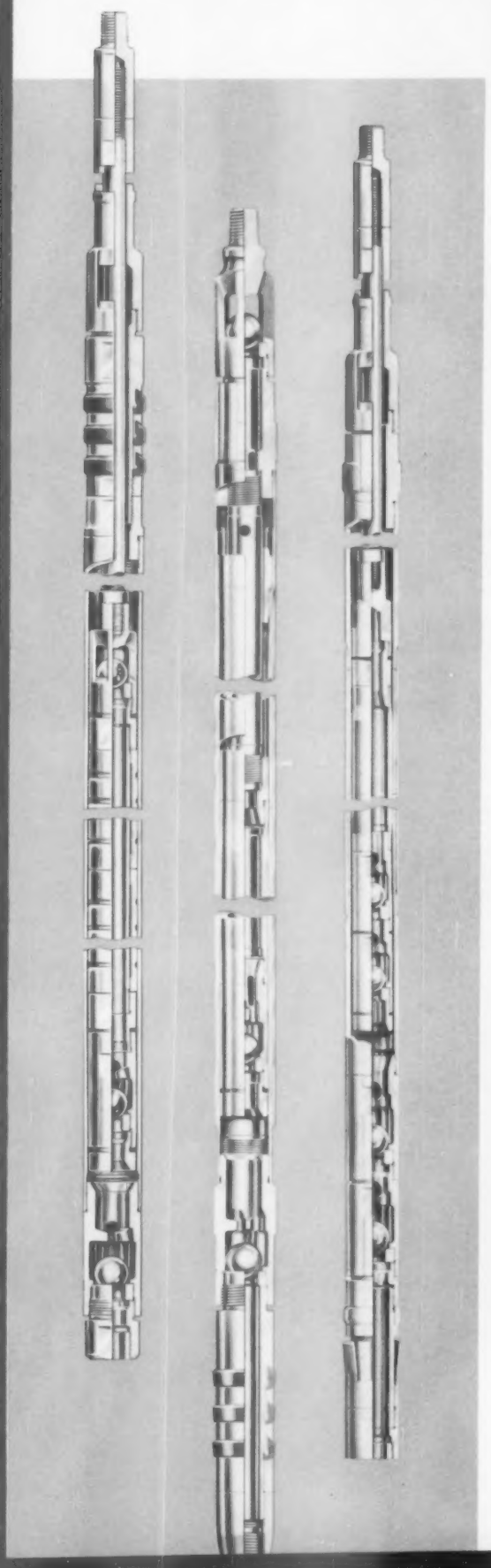

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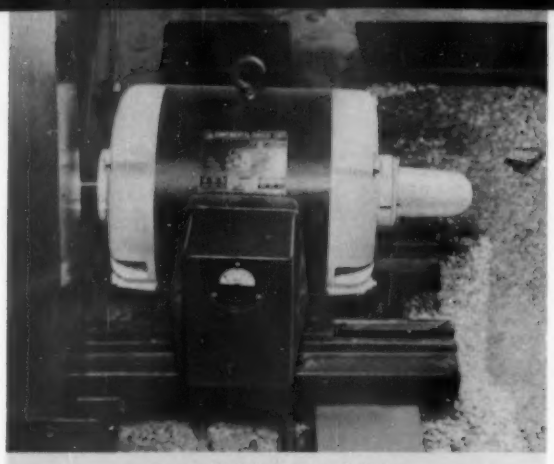
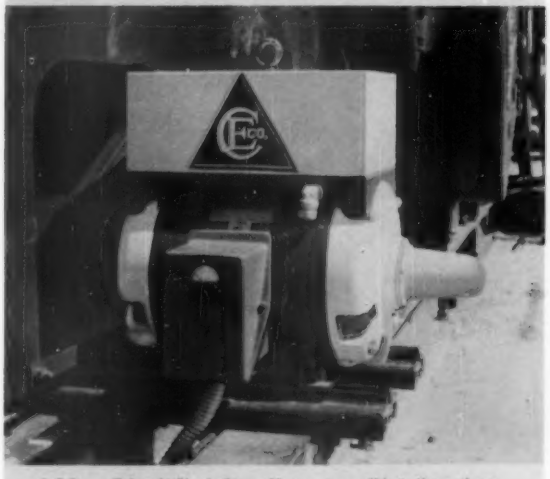


Standard C-E Green Triangle Motor



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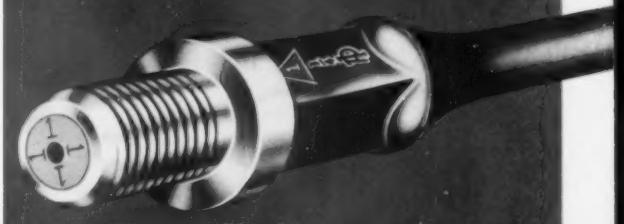

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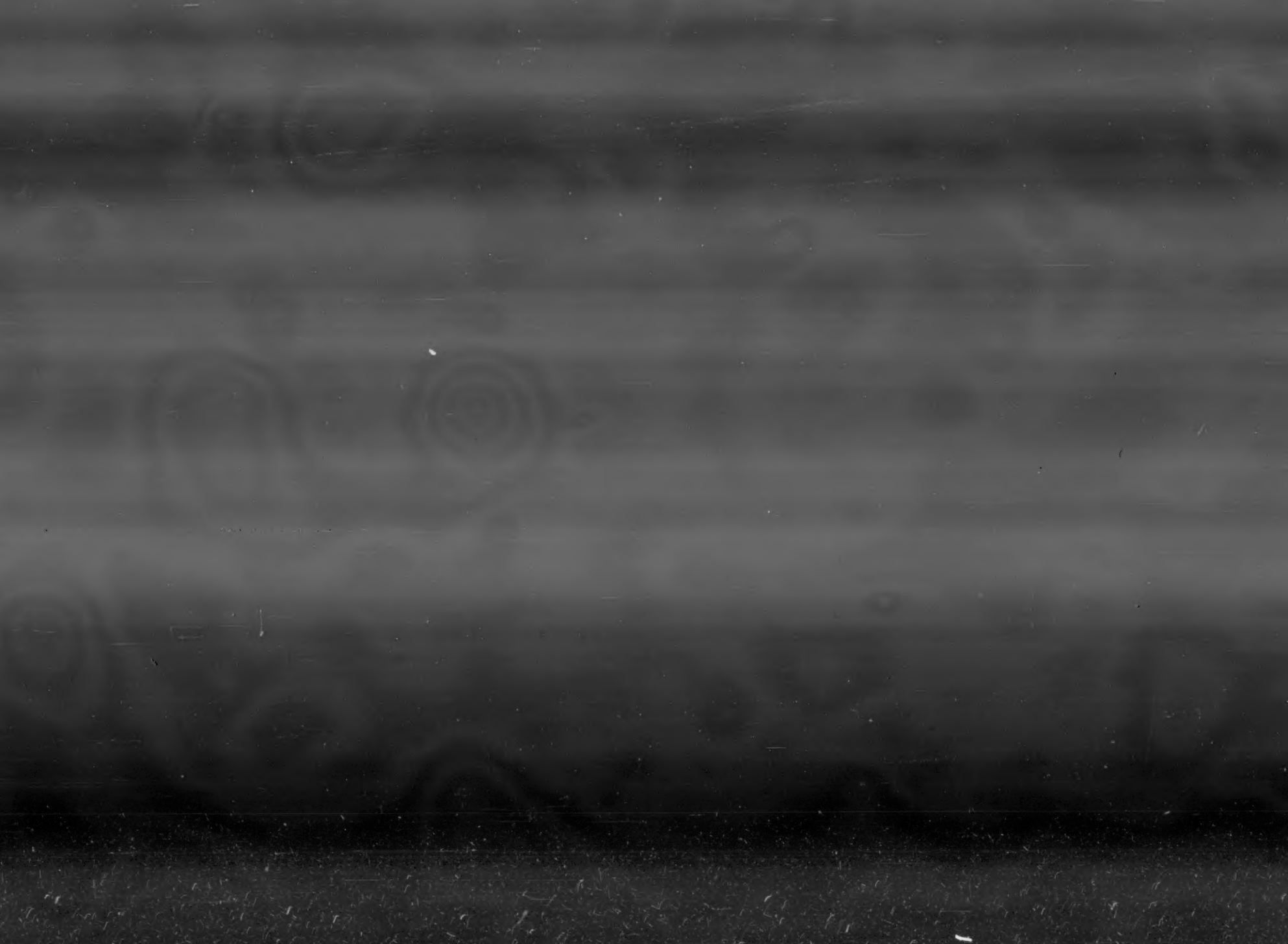

one of South Louisiana's largest in areal extent. Productive area, stretching across the Allen-Beauregard parish line, is more than 7 miles long from east to west, and 1½ to 2 miles wide.

## Louisiana deep pair proves productive

One of two ultradeep wildcats, less than a mile apart, which Sohio Petroleum Co. has been drilling in the north-central part of Vermilion Parish, Coastal Louisiana, has proved productive. The other has run casing for production tests.

The new producer is the company's 1 Paula Simon Bracquet, which flowed 125 bbl. of oil per day while testing through 6/64-in. choke. Flow through 8/64-in. choke was 99 bbl. daily. Test through the 6/64-in. choke got 200 M.c.f.d. of gas. Total fluid had 36% b.s. and w. Gravity of the oil is 46°.

Pay is a 7-ft. sand, topped at 11,817 ft. Several deeper sands, one below 17,000 ft. and another at 16,100 ft., have been tested, flowing gas and water. Total depth of the hole is 17,280 ft. Additional testing is being done before final completion.

Location is 4 miles southwest of LeRoy field, nearest other production. LeRoy field, discovered in 1955, is productive of gas and condensate. Kaplan, an other field discovered in 1947, is slightly more than 4 miles southwest.

Sohio's other deep wildcat, 1 Hubert Simon et al., in the adjoining section (33-11s-2e) on the north, stopped at 15,300 ft., where 5½-in. casing has been run.

## Big California gas well due for dual completion

A gas well described as the best in California so far this year will be dually completed.

The operator plans to complete the 1 Helen McLaughlin, 32-15n-1e, in Sutter County, in two sections of the "F" zone (Cretaceous). One completion will be made at 6,924-94 ft. and a second at 7,305-7,480 ft.

The upper zone includes a series of sand stringers and the lower three sand intervals with a series of stringers.

During test of six zones, the well flowed at a rate of 33,020 M.c.f.d. (OGJ, July 18, p. 72). The zones covered 594 ft. of perforated intervals, but the well is believed to have about 94 ft. of effective pay sands.

Cameron Oil Co. and Franco Western Oil Co. have staked location for another "F" zone test about 8,000 ft. northeast of the 1 Helen McLaughlin. The 1 McLaughlin is the northeast offset of the Grimes field discovery well. Cameron is operator for the two companies.

## Well sets Michigan depth record

C. A. Lee 1 Ferris, C SE NE 5-5n-2e, Shiawassee County, a Humble-Carter farmout, bottomed for plug at 6,816 ft. to set a 4-year depth mark in Michigan. Test logged Trenton at 5,885 ft. and St. Peter sand at 6,754 ft. It showed salt water on drill-stem.

The Shiawassee County wildcat was the deepest gas/oil test drilled in Michigan since 1956 when Don F. Rayburn reached 9,128 ft. on a Tuscola County wildcat.

# Discovery Wells

### WESTERN CANADA

Alberta:

Omega 7-6 Enchant, LSD 7, 6-14-17w4. Bow Island and Blairmore discovery. TD 3,472 ft.

CPOG 10-13 Hussar, LSD 10, 13-27-21w4. Blairmore gas discovery. TD 4,689 ft.

Western Natural Gas Co. et al. 6-21 Leedale, USD 6, 21-41-3w5. Basal Quartz gas discovery. TD 7,130 ft.

Cypress 7-6 Hatton, LSD 7, 6-12-28w3. Medicine Hat gas discovery. TD 1,902 ft.

Mic Mac Mayfair 10-35 Hilda, LSD 10, 35-182w4. Bow Island gas discovery. TD 1,678 ft.

Cypress 10-3 Kincorth, LSD 10, 3-12-28w3. Medicine Hat gas discovery. TD 2,608 ft.

Banff-Mobil 6-15 Matziwin, LSD 6, 15-23-14w4. Bow Island gas discovery. TD 3,401 ft.

NNGPCO 11-22 1-A Donalda, LSD 11, 22-41-18w4. Viking and Basal Quartz gas discovery. TD 5,390 ft.

Saskatchewan:

Cypress 7-33 Mair, LSD 7, 33-11-28w3. Medicine Hat gas discovery. TD 1,800 ft.

### CALIFORNIA

Ventura County:

Texaco Inc. 1 Vancouver Fee, NE SW NE, 11-3n-20w. IPF 258 BPOD with 6.8% water cut. Perforations 10,423-10,688 ft. TD 10,729 ft. New pool discovery in Bardsdale field.

Yolo County:

Artnell Co. and Universal Consolidated Oil Co. 1 University-Richey et al. E½ SW 35-11n-1w. IP 2,250 M.c.f.d., 5/16-in. choke from 8,077-97 ft. and 4,000 M.c.f.d. through four ½-in. perforating hole from 3,064 and 3,065 ft. TD 9,088 ft. Deeper pool discovery in Dunningan Hills gas field.

### NORTH TEXAS

Archer County:

Gulf Oil Corp. 1 W. R. Hammond et al., Lot 80, H. Corzine Sur. A-56. IPF 432 BOPD, Ellenburger open hole top pay 5,706 ft. 43°. TD 5,777 ft. New discovery.

Clay County:

Star Oil Co. Inc. 2 Annie T. Morris "C," A. Graham Sur. A-757. IPF 41 BOPD, ¼-in. choke, 3,684-88 ft. TD 3,974 ft. New oil discovery.

### WEST TEXAS

Nolan County:

Thomas D. Humphrey Oil Properties Ltd. 1 Rugh Boyd, OWDD, 2 miles southeast of Sweetwater, Sec. 65, Blk. 21, T&P Sur. IPF 198 BOPD, 16/64-in. choke, 44.2°, GOR 138:1, FTP 135 psi. Ellenburger 6,353-57 ft.; IPF 726 BOPD, 16/64-in. choke, 38.8°, GOR 457:1, CP 395 psi., Caddo 6,223-39 ft. TD 6,447 ft. Dual oil discovery.

Runnels County:

H. M. Gogle 1 L. E. Jacobs, OWWO, H. G. Gee Sur. 42½. IPP 68 BOPD, plus 25% water, 41°, GOR 100:1. 4,302-10 ft. TD 4,469 ft. New oil discovery.

Tal Veg Oil Co. 1 Vela Laird, Blk. 12, Marshall University Sur. 511, 7.5 miles northeast of Winters. IPF 140 BOPD, 14/64-in. choke, 42°, GOR 936:1. TP 360 psi. Penn. 3,950-60 ft. TD 4,015 ft. New oil discovery.

Upton County:

Bill Roden & Dixilyn Drilling Corp. et al. 3 TXL, 24 miles northwest of Rankin in Sec. 17, Blk. 41, T-5-S, T&P Sur. IPF 122 BOPD, plus 8.2% water, 20/64-in. choke, 59°, GOR 2763:1, TP 1,500 psi. Devonian 12,036-53 ft. TD 13,210 ft. PBTD 12,171 ft.

### SOUTHWEST TEXAS

Duval County:

Flournoy Production Co. 1 Victor C. Gonzales, El Senor de la Carrera Grant, A-208, ½ mile east of Rios. AOF 4,200 M.c.f.d., dry gas, shut-in TP 1,219 psi., perf. 3,159-64 ft., Frio. TD 3,860 ft. Revives and extends Independence field.

Jim Wells County:

Katz Oil Co. 1-C Henry P. Knolle, Blk. 6, J. H. Gallagher Subd., Casa Blanca Grant, 5 miles southeast of Sandia. IP 68 BOPD, 8/64-in., 37°, GOR 890 cu. ft. per bbl., TP 320 psi., perf. 5,319-22 ft., Frio. TD 5,350 ft. New-field discovery—Fort Lipan.

L. M. Fischer 1 Bella S. Freeborn, J. O. Winburn Sur., A-534, 14 miles northwest of Orange Grove. IP 81 BOPD (net), 15% water, ⅛-in., 40.5°, GOR 430 cu. ft. per bbl., TP 480 psi., perf. 5,088-91 ft., Hockley. TD 6,806 ft. New-field discovery—Fischer.

### WEST CENTRAL TEXAS

Taylor County:

Jack F. Grimm 1 C. M. Hunt, 5 miles southwest of Moro in Sec. 124, Blk. 64, H&TC Sur. IPF 111 BOPD, 4,468-70 ft. TD 5,076 ft. New oil discovery. Prorated in Regular field.

### EAST TEXAS

Van Zandt County:

Pure Oil Co. and Texaco Inc., 1 J. G. Flatt Unit, V. B. Hubbard Sur., A-352, 7 miles west of Martins Mill. IP 242 BOPD, 24-64-in., 47.7°, GOR 1,127 cu. ft. per bbl., TP 125 psi., perf. 10,676-82 ft., Cotton Valley. TD 14,678 ft. in Smackover. Elev. 546 ft. (G) Cotton Valley 10,104 ft., Buckner 12,634 ft., Smackover 13,185 ft. Jurassic discovery well in abandoned Tundra field (one Rodessa well).

### NEW MEXICO

Rio Arriba County:

El Paso Natural Gas Products Co. 89 Canyon Largo, SW SW 17-24n-6w. IPF Gallup 6,058 M.c.f.d., ¾-in. choke, 5,448-5,502 ft.; IPF Dakota 1,489 M.c.f.d., ¾-in. choke, 6,288-6,458 ft. TD 6,664 ft. PBTD 6,589 ft. SITP 1,573 psi., 2,082 psi. New Dakota discovery.

**Raymond D. McGranahan** . . . getting acquainted with Wilshire's operations.

# Wilshire Gets New President

• One of Gulf's top administrators now holds the reins of the company's new West Coast refining, marketing firm.

INSTEAD of going on a fishing vacation to Canada last month, Ray McGranahan was sidetracked to California to take over as president of Wilshire Oil Co., Los Angeles.

McGranahan learned of his appoint to Wilshire's top job when he went in to outline his vacation plans to his boss at Gulf Oil Corp.'s Pittsburgh headquarters. He was administrative vice president and coordinator of transportation for Gulf before his move west.

In his new post, McGranahan is charged with running Gulf's newest subsidiary. And as he explains it, he primarily will appraise Wilshire's position in the West Coast marketing and refining picture and recommend to Gulf just how to make the company grow.

And he is quick to point out that the Wilshire purchase is not a case of a giant corporation swallowing up an independent firm and forgetting it. Wilshire is the vehicle Gulf is using to get into the West Coast marketing picture. He admits Gulf is hopeful of some day entering the West Coast with its own brand, but right now it is Wilshire that will get the attention (OGJ, July 25 p. 136).

"And any building up will be with the people we have," he adds.

McGranahan succeeds Edwin G. Coopman as Wilshire's president. Coopman will remain on Wilshire's board and will serve the company in an advisory capacity.

**Duties with Gulf** . . . Taking over as the chief administrator of Wilshire is just one in a series of administrative jobs McGranahan has held down in recent years.

During his 2 years as a Gulf administrative vice president, he got well acquainted with the parent company's world-wide operations by handling transportation matters involving production, marketing, and refining operations. And he did a lot of traveling, touching base in several parts of the world.

Since joining Gulf in 1948, McGranahan has picked up experience in every phase of the business. He has served on committees which have reorganized marketing and production operations and as chairman of the administrative committee of Gulf, which consists of a coordinator for each of the company's major departments.

Before being named an administrative vice president, he was vice president responsible for the direction and coordination of all forms of transportation. This brought him in direct contact with Gulf's pipeline and tanker operations. Wilshire's 33,000-bbl. refinery in suburban Los Angeles is connected with Four Corners Pipe Line, a crude system in which Gulf holds 20% ownership.

In the refining end of the business, McGranahan literally knows the business from the ground up. Back in 1940 he went through a training program with National Refining Co. in Cleveland which included a tour with the maintenance crew.

"You learn to know what people are talking about in a refinery after you've painted and scrubbed some of the equipment," he says.

After the war in 1946, McGranahan joined United States Pipe Line Co. in New York, then 2 years later went with Gulf as a member of the staff of the assistant to the president.

A native of Harmonburgh, Pa., he graduated from high school and Allegheny College in Meadville, Pa. He also completed graduate work at the Harvard School of graduate business administration.

McGranahan may have missed a fishing trip as result of his move to Wilshire, but it hasn't dampened his enthusiasm for running the West Coast's biggest independent marketing firm. Besides, his office in downtown Los Angeles is less than a hour's drive to the Pacific, where there is plenty of room for him to wet a line.

## ▶▶▶ Personals

**Marc O. Miller** has been appointed division geophysicist by Continental Oil Co., Los Angeles.

**Eric B. Hjerpe** has been named director of operations planning and scheduling at Gulf Oil Corp.'s Port Arthur, Tex., refinery. He replaces **Marvin L. Ralston,** who has been transferred to Gulf's general offices in Pittsburgh. **Herman Taylor, Jr.,** will take Hjerpe's place as supervisor of special projects in the process-engineering division.

**Jack A. Conners,** Hobbs, N. M., consultant, has joined Camay Drilling Co. as division drilling engineer in Los Angeles.

**Dr. Edward P. King** has been promoted to assistant manager of the refining division of Pure Oil Co.'s operating department.

**P. R. Coronado** has been promoted by Republic Oil Refining Co., in Texas City, Tex., to operations superintendent.

**Britty N. Brown,** district production foreman, Sinclair Oil & Gas Co., Monahans, Tex., has been transferred to the Silsbee district.

**D. E. Anderson** and **C. E. Cole** have been named vice presidents of Canada-Cities Service Petroleum Corp. Anderson will continue duties as manager of operations, and Cole will direct the exploration program of Canada-Cities Service.

**Robert B. Capps** has been appointed southeastern exploration manager by British-American Oil Producing Co., New Orleans. He was formerly southern division manager for Kerr-McGee Oil Industries, Inc. **Dan D. Brengle,** acting manager for British-American since March, will resume his duties as division land man and office manager.

GRIGONIS

**Leo V. Grigonis** has been named general manager for Mobil International Oil Co. in Ghana, Sierra Leone, and Liberia. He replaces **Richard M. Sheridan,** who is returning to the United States for advanced management training prior to a new assignment. Grigonis, who will be headquartered in Accra, Ghana, joined Mobil in 1946 and prior to his new position, was general manager of Mobil Oil do Brasil.

**William E. Brigham** has been named senior research engineer and **John A. Sievert** has been appointed research engineer in the recovery-processes section of Continental Oil Co.'s production research division, Ponca City, Okla. **E. S. Karstedt, Jr.,** has been promoted to the newly created director of lubricating oils and wax sales for Continental in Houston.

**J. T. Isberg,** vice president in charge of exploration for the western division of Superior Oil Co., will head the new division headquarters in Denver. Others in the new Denver office will be **N. W. Engel,** manager of exploration; **B. H. Kunau,** western division manager of drilling and production; **T. C. Holt,** western division geophysicist; **J. H. Cox,** division landman; **R. E. Jensen,** manager of land and lease records; **R. D. Poulson,** attorney; and **A. H. Ray,** materials control supervisor.

**V. W. Fletcher** has been elected vice president of Asiatic Petroleum Corp., succeeding **S. J. Veenstra,** who will move to London with Shell International Petroleum Co.

**C. D. Dever** of technical service and development, Dow Chemical Co., has transferred to Tulsa with the Dowell division. He will handle liaison between Dowell and company departments on chemical-development projects.

**Edward B. Seaton** and **James A. Singmaster, Jr.,** have been appointed assistant general managers of Monsanto Chemical Co.'s overseas division in St. Louis. **Rockford D. Casey** and **Richard M. Kelly** have joined the engineering department of Monsanto's organic chemicals division, and **Dr. Lowell R. Smith** has joined the division in research, all in St. Louis.

**G. G. Coombs,** mechanical superintendent in American Oil Co.'s Texas City refinery, has been transferred to the Yorktown, Va., refinery in the same capacity. **R. C. Steinhoff, Jr.,** operating superintendent, will succeed Coombs at Texas City, and **C. J. Houlgrave,** chief refining engineer, will succeed Steinhoff. **W. R. Standefer, Jr.,** assistant mechanical superintendent, has been named chief refining engineer, and **P. A. Stewart** is being transferred from Yorktown to take Standefer's place. The changes are effective August 1.

**Paul E. Geiser** has been appointed general manager of petrochemical manufacturing for Continental Oil Co., Houston, a newly created position. He was formerly manager of the detergents division. **K. R. Gerhart** has been named assistant general manager of petrochemical manufacturing and will move from Gretna, La., to Houston. **J. E. Waples** will succeed Gerhart as superintendent of the Gretna petrochemical plant. In other Continental Oil changes, **G. C. Sawvel,** Oklahoma City, has been promoted to regional engineer, western region. He was formerly district production superintendent at Oklahoma City. He will move to Los Angeles to succeed **L. P. Brown** who moved to Conoco's production engineering staff at Houston. **Edwin J. Jennings, Jr.,** has been promoted to technical assistant to the general manager of manufacturing, Houston. He was formerly senior process engineer at Ponca City, Okla., and now succeeds **George A. O'Brien** who was transferred to Denver as technical assistant to the Rocky Mountain region manufacturing manager for Continental.

# ▶▶▶ Personals

**Floyd Brett,** vice president and central division manager of Sinclair Oil & Gas Co., has been elected executive vice president of Sinclair Canada Oil Co., Calgary. He will be succeeded in Tulsa by **Richard M. Kobdish,** now assistant manager of the South Texas

BRETT

KOBDISH

division in Houston. **David L. Dobie,** central division exploration superintendent, has been promoted to assistant manager of the division. Two Sinclair Oil & Gas executives were named directors of Sinclair Canada. They are **Joseph B. Kennedy,** executive vice president for operations, and **M. M. Shumard,** controller.

**J. M. (Jack) Lawson** has been named plant superintendent of Berry Refining Co.'s Gary, Ind., plant. He formerly was superintendent of Pure Oil Co.'s refinery at Lemont, Ill.

**F. D. Leigh** has been named manager of Shell Oil Co.'s new marine production group, Houston. He formerly was production superintendent in Shell's New Orleans marine production area.

**H. H. Kister,** senior staff geologist for Pan American Petroleum Corp. in Tulsa, has retired after 33 years with the company and its predecessors. Kister was Pan Am central division exploration manager before being named senior staff geologist. He plans to open consulting offices in Tulsa.

**M. E. Fox,** division engineer, has been named production superintendent in the new Lafayette district production office of Tennessee Gas & Oil Co. **G. H. Gilbreath,** operations foreman, has been named district foreman; **G. P. Walker, III,** petroleum engineer, has been promoted to district petroleum engineer; and **J. P. Cox,** senior production clerk, has been made district office supervisor. **H. H. Castleberry, Jr.,** has been named supervisor of the Lafayette division office, and will be replaced as supervisor of the Lafayette offshore district office by **E. L. Patterson,** who is being transferred from Wichita Falls.

## Personals

**John O. Bower** has been elected president and chief executive officer of Colsag Corp., jointly owned subsidiary of Socony Mobil Oil Co., Inc., and Texaco Inc. **Frank L. LeRoy** has been elected vice president of the firm and will serve as general manager of Colsag's subsidiaries, Colombian Petroleum Co. and South American Gulf Oil Co. LeRoy succeeds **Max E. Crawford,** who has returned to Texaco. LeRoy previously was director of Socony Mobil's affiliates in Colombia, Peru, and Venezuela. Bower was executive vice president of Colsag.

BOWER

LEROY

**R. N. French** has been promoted to staff engineer in the technical division at the Baytown, Tex., refinery of Humble Oil & Refining Co. He will coordinate the mechanical, civil and instrument engineering on major additions plus maintenance engineering on existing facilities.

**E. H. Leeman,** a senior exploration engineer for Shell Oil Co., has been named a member of the National Petroleum Council. He has also been named member of the Petroleum Administration for Defense's petroleum subcommittee, District No. 3, and vice chairman of Louisiana, Arkansas, Mississippi and Alabama group of NPC's committee on proved petroleum and natural-gas reserves and availability.

**Harold E. Berg** has been named southern division production manager in Houston for Tidewater Oil Co. Berg succeeds **J. H. Wents, Jr.,** who has been transferred to the home office in Los Angeles. **E. E. Tucker** has transfered from Houston to Los Angeles as assistant production manager in the western division. **George H. Truran** moves from Los Angeles to Houston to take the assistant production manager post. Other Tidewater changes at Houston: **Douglas L. Ratliff,** who succeeds retiring **J. E. (Doc) Johnson** as purchasing manager; **Wendell J. Haugh,** named division mechanical engineer, and **Herman E. Wendt,** promoted to division petroleum engineer.

**William C. Spencer,** has been moved to Los Angeles as advisor to the division natural-gas manager for Mobil Oil Co. He formerly was a division engineer in Salt Lake City.

**Marshall McDonald,** vice president and financial coordinator of Sinclair Oil & Gas Co., has been elected to the board of directors. He joined Sinclair in 1959.

**Eber H. Peters** has been appointed manager of southwestern manufacturing, in Mobil Chemical Co.'s basic petroleum chemicals division. His headquarters will be at Beaumont, Tex.

**Allan L. Piper** has been named manager of western division pipelines for Tidewater Oil Co. He moves to Los Angeles from New York, where he was in charge of transportation activities. He has been with Tidewater since 1937.

**Dr. E. W. Gardiner** has been appointed senior research coordinator, petroleum products department, San Francisco, by California Research Corp., a subsidiary of California Standard. **Dr. H. Resnick** has been named supervising research engineer, process and plant design section, Richmond laboratory, for the firm.

**Wallace W. Rangeler** and **Herbert L. Durgan** have been named senior research geologists in the geological department of Sun Oil Co.'s Gulf Coast production division, Beaumont. **Allen M. Borland, Jr.,** has been named assistant to the division chief geologist and **W. T. Storie, Jr.,** has been made regional geologist in charge of development. **Fred H. Christian, Jr.,** will be assistant regional geologist in development. The men will headquarter in Beaumont.

**William S. Davidson, Jr.,** has been named manager of eastern division transportation for Tidewater Oil Co., New York. Previously, he was general superintendent of the western division pipeline department.

**Dr. Alan C. Batchelder** has been named by Shell Development Co.'s licensing division as manager of chemical licensing in New York. Currently, he is head of the organic chemical department at Emeryville, Calif.

**Leland F. Stanley,** head engineer in charge of materials handling and field engineers group in Indiana Standard's refining engineering division at Whiting, Ind., has been named president of the Chicago chapter of the American Material Handling Society.

**Roy W. Graves, Jr.,** has joined the Lion Oil Co. division of Monsanto Chemical Co. as a geologist on the regional geological staff, Denver. He was previously a geologist with California Co. and California Research Corp.

**Thomas R. Bird, Franklin O. Canfield** and **Kenneth C. Hunt** have been elected directors of Esso Research, Ltd. Bird is general manager of the company; Canfield is Jersey Standard shareholder representative for France, Austria, Germany, Italy and Switzerland, and Hunt is laboratories manager.

**James E. Moss,** American Petroleum Institute director of transportation, will retire August 1. He has headed the division since it was organized in 1946 and will continue to serve as special consultant on the president's staff after retirement. **B. H. Lord, Jr.,** transportation division's associate director, will succeed Moss. Lord has been with API since 1946.

## Deaths

**Harry Blaufelder,** former assistant superintendent of refinery operations for Sunset International Petroleum Corp., died July 17 in Long Beach.

**William P. Wiechel,** 88, retired independent operator, died July 22 after suffering an apparent heart attack at his home in Tulsa.

**John J. Black,** 69, died July 22 in Tulsa after a long illness. He was a retired drilling contractor and broker.

**Mac Donell Roehm,** 57, coordinator of marketing at Standard-Vacuum Oil Co.'s international headquarters, White Plains, N. Y., died July 20 at his home in Darien, Conn. He joined Stanvac in 1926.

**Charles F. Gibbs,** 82, a retired oil producer, died in Caney, Kans., July 20.

**Chauncey Depew (Chan) Klingensmith,** 75, died at his home in Sapulpa, Okla., July 20. He had been an oil operator around Sapulpa since 1907.

**William H. Hackathorn,** 71, died July 22 at his home in Fort Collins, Colo. He pioneered in oil exploration in Pennsylvania and California.

# COST ENGINEERING

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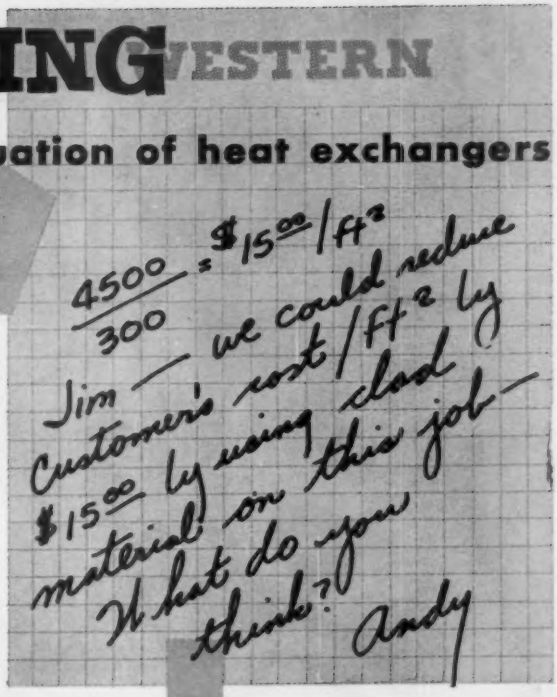


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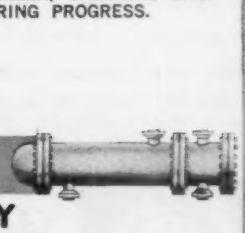
# WESTERN

## HEAT EXCHANGERS



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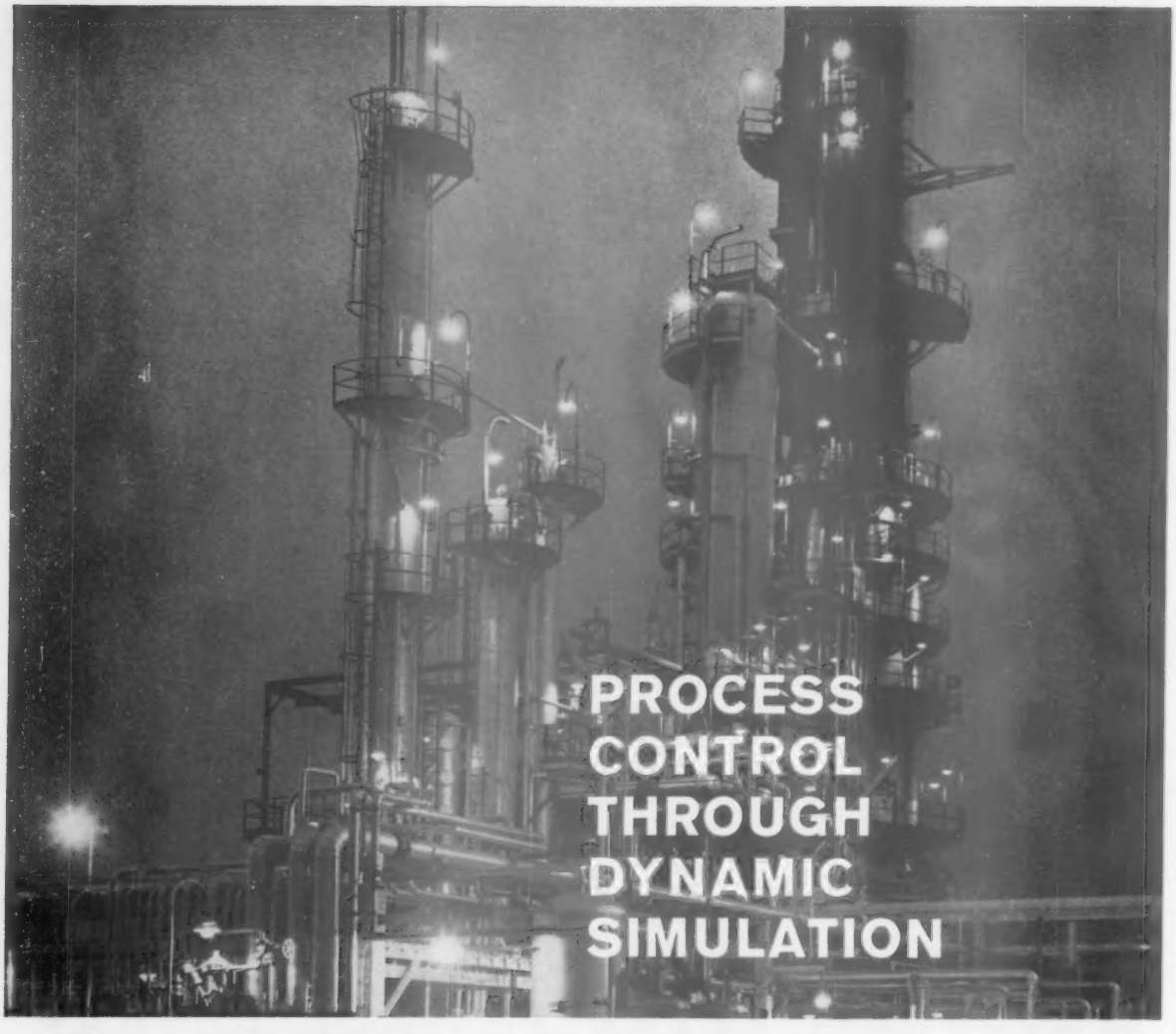


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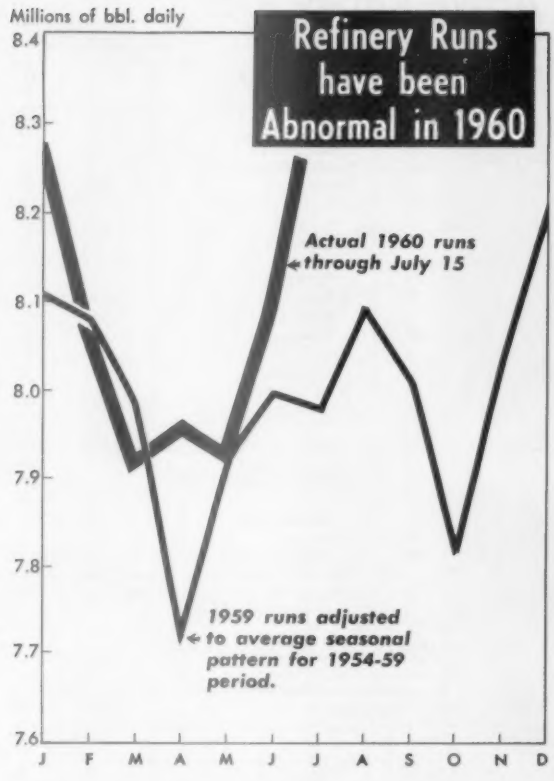



# Recent gains in runs don't make sense

BY JOHN C. CASPER

REFINERY RUNS are the craziest figures. And, they have been crazier than ever in 1960.

Refinery operations do not follow the normal seasonal pattern of demand. For example, in the 6-year period 1954-59 total demand for all products dropped 18.2% between January and July. On a volume basis, the decrease from winter to summer averaged 1,867,000 bbl. daily. Last year, the January-July drop was 2,350,000 bbl. daily.

In contrast with that big reduction in demand last year, refiners reduced crude runs only 350,000 bbl. daily between January and July. The January-July cut has averaged only 122,000 bbl. daily over the past 6 years, covering only a small portion of that 1,867,000-bbl. daily drop in demand.

The difference between changes in demand and changes in refinery runs must be made up by stock adjustments or shifts in other supply sources. Stock changes account for most of the difference between runs and demand.

In recent years, stocks of refined products have decreased as much as 64,000,000 bbl. during the first quarter of the year and have increased as much as 66,000,000 bbl. in the third quarter. This potential swing in product stocks of 130,000,000 bbl. can have a decided effect on product prices.

### High Runs Pressure Markets

Actual refinery operations for the past few years seem to indicate that refiners are crowding product markets at all seasons of the year. Runs tend to remain at a high level until excessive product inventories produce cuts in product prices. It doesn't take much of a product surplus to lower product prices, but rebuilding a sound market structure is a slow and tedious process.

Let's take a look at the spring supply-demand picture for the past 2 years. The big change starts in March. Last year, refiners boosted runs in March, but demand dropped half a million barrels daily.

This year, runs were cut 150,000 bbl. daily in March and total demand actually increased 526,000 bbl. daily over February.

Normally, refinery operations reach the low point of the year in April. This year, high demand and low runs in March cleaned up some of the inventory surplus. But not for long. Refiners increased input 43,000 bbl. daily in April while total demand was dropping 1,680,000 bbl. daily. Major product stocks increased in April for the first time since 1955.

Depressed product markets pushed runs down in May. The lower operating level continued through June 10. By that time product prices were firming in most of the important market areas. It was time for another cycle. Runs started back up.

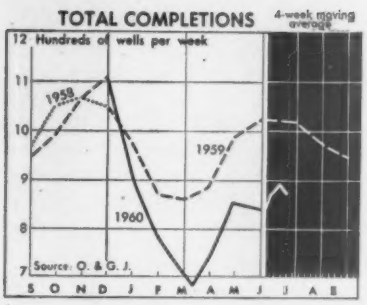
Refinery input averaged 8,266,000 bbl. daily for the 4-week period ended July 15 or slightly more than the January rate. But, midsummer demand has been at least 1,300,000 bbl. daily less than it was in January. Major product stocks increased 16,463,000 bbl. in the 4-week period between June 17 and July 15. The gain for the corresponding period last year was 8,119,000 bbl.

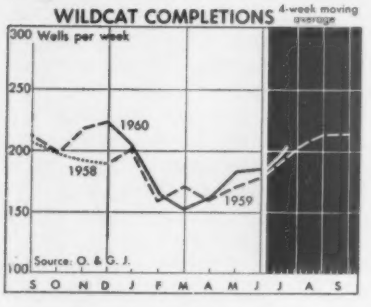
There is nothing to justify the pattern of refinery runs so far this year. Take a look at the 1960 line on the chart.

## A quick look at the highlights . . .

| | LATEST WEEK | Change from WEEK AGO | | Change from YEAR AGO | |
|---|---|---|---|---|---|
| Production | 6,856,000 | UP | 44,000 | DOWN | 3,000 |
| Crude stocks | 245,917,000 | DOWN | 3,203,000 | DOWN | 24,450,000 |
| Completions | 807 | DOWN | 138 | DOWN | 251 |
| Refinery runs | 8,204,000 | DOWN | 53,000 | UP | 252,000 |
| Gasoline stocks | 194,779,000 | DOWN | 2,462,000 | UP | 6,622,000 |
| Kerosine stocks | 29,533,000 | UP | 376,000 | UP | 569,000 |
| Distillate stocks | 123,920,000 | UP | 2,493,000 | DOWN | 10,543,000 |
| Residual stocks | 43,488,000 | UP | 475,000 | DOWN | 11,301,000 |
| Four-product stocks | 391,720,000 | UP | 882,000 | DOWN | 14,653,000 |
| Total imports | 1,630,000 | UP | 211,700 | UP | 386,200 |

## DRILLING




# Active Rotary Rigs

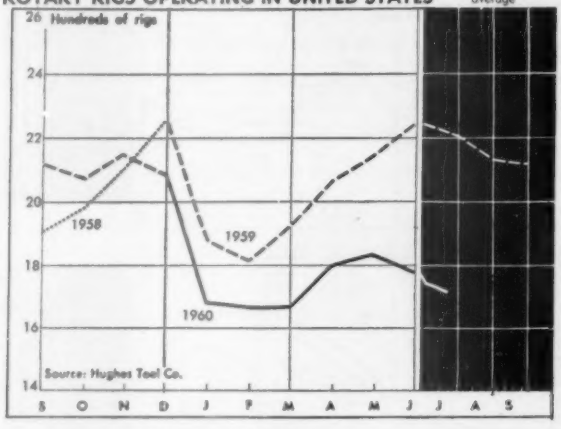
| | 7-25-60 | 7-18-60 | 7-27-59 |
|---|---|---|---|
| Alabama | 3 | 2 | 9 |
| Alaska | 5 | 5 | (†) |
| Arkansas | 11 | 12 | 15 |
| Arizona | 0 | 0 | 1 |
| California | 90 | 83 | 88 |
| Land | 87 | 79 | 83 |
| Offshore | 3 | 4 | 5 |
| Colorado | 34 | 31 | 57 |
| Florida | 2 | 2 | 1 |
| Land | 2 | 2 | 0 |
| Offshore | 0 | 0 | 1 |
| Illinois | 43 | 37 | 38 |
| Indiana | 12 | 7 | 6 |
| Iowa | 0 | 0 | 2 |
| Kansas | 106 | 110 | 140 |
| Kentucky | 4 | 5 | 4 |
| Louisiana | 296 | 302 | 364 |
| North | 40 | 45 | 45 |
| S. Inland waters | 113 | 115 | 144 |
| S. Land | 81 | 86 | 120 |
| Offshore | 62 | 56 | 55 |
| Maryland | 1 | 1 | 0 |
| Michigan | 42 | 45 | 26 |
| Mississippi | 54 | 54 | 65 |
| Missouri | 1 | 1 | 1 |
| Montana | 21 | 22 | 27 |
| Nebraska | 26 | 26 | 27 |
| Nevada | 0 | 0 | 1 |
| New Mexico | 107 | 106 | 110 |
| New York | 0 | 0 | 1 |
| North Dakota | 15 | 17 | 31 |
| Ohio | 5 | 5 | 5 |
| Oklahoma | 160 | 167 | 236 |
| Oregon | 0 | 0 | 0 |
| Pennsylvania | 10 | 11 | 9 |
| South Dakota | 0 | 0 | 3 |
| Texas | 554 | 570 | 767 |
| S. Inland waters | 5 | 5 | 10 |
| S. Land | 164 | 183 | 198 |
| Offshore | 1 | 1 | 0 |
| North | 47 | 54 | 150 |
| Panhandle | 43 | 31 | (*) |
| East | 46 | 49 | (*) |
| West Central | 160 | 156 | 265 |
| West | 88 | 91 | 144 |
| Utah | 27 | 33 | 33 |
| Washington | 1 | 1 | 1 |
| West Virginia | 4 | 5 | 11 |
| Wyoming | 72 | 70 | 87 |
| Total U. S. | 1,706 | 1,730 | 2,166 |
| Western Canada | 185 | 173 | 145 |
| Eastern Canada | 1 | 1 | 0 |
| Grand total | 1,892 | 1,904 | 2,311 |

Hughes Tool Co. report. *Included in North. Comparisons not available due to change in method of reporting. †Data first reported 4-4-60.

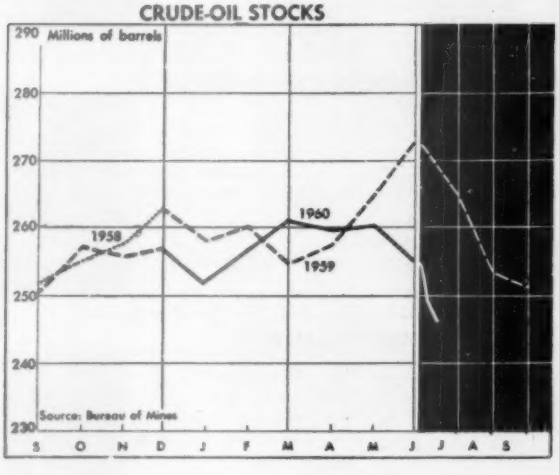
## WEEKLY WELL COMPLETIONS . . . WEEK ENDED JULY 23, 1960

| | Total wells | | | | | | | Cum. | | Total wildcats | | | | | Cum. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | Crude | Cond. | Gas | Dry | Service | Footage | 1960 | 1959 | Total | Crude | Cond. | Gas | Dry | 1960 | 1959 |
| Alabama | 1 | 1 | 0 | 0 | 0 | 0 | 11,566 | 28 | 55 | 0 | 0 | 0 | 0 | 0 | 1 | 12 |
| Arizona | 8 | 0 | 0 | 0 | 8 | 0 | 11,493 | 18 | ..... | 5 | 0 | 0 | 0 | 5 | 15 | ..... |
| Arkansas | 7 | 3 | 0 | 0 | 4 | 0 | 22,261 | 339 | 483 | 3 | 0 | 0 | 0 | 3 | 90 | 84 |
| California | 75 | 57 | 0 | 6 | 12 | 0 | 280,603 | 917 | 844 | 11 | 1 | 0 | 1 | 9 | 158 | 202 |
| Colorado | 12 | 6 | 0 | 0 | 6 | 0 | 53,747 | 345 | 421 | 4 | 1 | 0 | 0 | 3 | 168 | 249 |
| Illinois | 49 | 16 | 0 | 0 | 19 | 14 | 92,597 | 1,130 | 1,209 | 6 | 1 | 0 | 0 | 5 | 245 | 194 |
| Indiana | 16 | 4 | 0 | 0 | 12 | 0 | 21,585 | 526 | 451 | 6 | 1 | 0 | 0 | 5 | 203 | 151 |
| Kansas | 56 | 24 | 0 | 5 | 26 | 1 | 219,213 | 1,804 | 2,222 | 16 | 2 | 0 | 1 | 13 | 587 | 506 |
| Kentucky | 22 | 2 | 0 | 11 | 9 | 0 | 54,285 | 876 | 1,407 | 2 | 0 | 0 | 0 | 2 | 103 | 99 |
| Louisiana | 63 | 28 | 7 | 7 | 20 | 1 | 453,223 | 1,925 | 2,000 | 12 | 3 | 1 | 0 | 8 | 303 | 258 |
| North | 28 | 12 | 0 | 7 | 9 | 0 | 91,279 | 695 | 719 | 4 | 2 | 0 | 0 | 2 | 141 | 100 |
| South | 26 | 12 | 4 | 0 | 9 | 1 | 245,640 | 941 | 1,061 | 6 | 1 | 1 | 0 | 4 | 141 | 148 |
| Offshore | 9 | 4 | 3 | 0 | 2 | 0 | 116,304 | 289 | 220 | 2 | 0 | 0 | 0 | 2 | 21 | 10 |
| Michigan | 25 | 3 | 0 | 0 | 11 | 11 | 70,445 | 458 | 335 | 6 | 0 | 0 | 0 | 6 | 127 | 82 |
| Mississippi | 10 | 6 | 0 | 0 | 4 | 0 | 108,118 | 394 | 351 | 3 | 1 | 0 | 0 | 2 | 141 | 166 |
| Montana | 5 | 0 | 0 | 0 | 5 | 0 | 23,469 | 167 | 175 | 5 | 0 | 0 | 0 | 5 | 81 | 57 |
| Nebraska | 18 | 5 | 0 | 0 | 13 | 0 | 98,154 | 468 | 470 | 12 | 2 | 0 | 0 | 10 | 193 | 197 |
| New Mexico | 33 | 17 | 1 | 9 | 6 | 0 | 186,991 | 1,030 | 1,082 | 6 | 1 | 1 | 1 | 3 | 163 | 128 |
| West | 12 | 4 | 0 | 8 | 0 | 0 | 67,817 | 336 | 489 | 1 | 0 | 0 | 1 | 0 | 39 | 39 |
| East | 21 | 13 | 1 | 1 | 6 | 0 | 119,174 | 694 | 593 | 5 | 1 | 1 | 0 | 3 | 124 | 89 |
| New York | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 187 | 149 | 0 | 0 | 0 | 0 | 0 | 26 | 13 |
| North Dakota | 5 | 3 | 0 | 0 | 2 | 0 | 29,300 | 169 | 294 | 3 | 1 | 0 | 0 | 2 | 43 | 58 |
| Ohio | 13 | 5 | 0 | 6 | 2 | 0 | 32,694 | 562 | 553 | 1 | 0 | 0 | 1 | 0 | 32 | 15 |
| Oklahoma | 75 | 29 | 1 | 8 | 30 | 7 | 303,291 | 2,194 | 3,298 | 11 | 0 | 0 | 1 | 10 | 422 | 478 |
| Pennsylvania | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 377 | 311 | 0 | 0 | 0 | 0 | 0 | 8 | 5 |
| South Dakota | 1 | 0 | 0 | 0 | 1 | 0 | 8,526 | 17 | ..... | 0 | 0 | 0 | 0 | 0 | 6 | ..... |
| Texas | 293 | 123 | 23 | 16 | 129 | 2 | 1,152,759 | 8,921 | 10,814 | 94 | 2 | 2 | 0 | 90 | 1,843 | 2,016 |
| District 1 | 36 | 15 | 0 | 0 | 21 | 0 | 86,890 | 610 | 648 | 20 | 1 | 0 | 0 | 19 | 237 | 181 |
| District 2 | 16 | 3 | 3 | 2 | 8 | 0 | 102,599 | 427 | 456 | 5 | 0 | 1 | 0 | 4 | 104 | 133 |
| District 3 | 26 | 8 | 7 | 0 | 11 | 0 | 186,239 | 685 | 661 | 4 | 0 | 0 | 0 | 4 | 125 | 133 |
| District 4 | 11 | 4 | 4 | 3 | 0 | 0 | 58,589 | 599 | 744 | 0 | 0 | 0 | 0 | 0 | 170 | 183 |
| East | 20 | 7 | 1 | 0 | 12 | 0 | 117,491 | 711 | 665 | 9 | 0 | 0 | 0 | 9 | 151 | 132 |
| District 7-B | 43 | 17 | 0 | 4 | 20 | 2 | 93,675 | 1,283 | 1,512 | 8 | 0 | 0 | 0 | 8 | 365 | 397 |
| West | 48 | 36 | 3 | 0 | 9 | 0 | 267,655 | 2,356 | 3,319 | 6 | 1 | 0 | 0 | 5 | 363 | 448 |
| District 9 | 68 | 20 | 2 | 0 | 46 | 0 | 154,186 | 1,666 | 2,044 | 42 | 0 | 1 | 0 | 41 | 289 | 346 |
| District 10 | 25 | 13 | 3 | 7 | 2 | 0 | 85,435 | 584 | 765 | 0 | 0 | 0 | 0 | 0 | 39 | 63 |
| Utah | 2 | 0 | 0 | 0 | 2 | 0 | 1,240 | 147 | 185 | 2 | 0 | 0 | 0 | 2 | 49 | 49 |
| West Virginia | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 429 | 416 | 0 | 0 | 0 | 0 | 0 | 4 | 13 |
| Wyoming | 15 | 6 | 0 | 0 | 9 | 0 | 66,212 | 563 | 520 | 9 | 0 | 0 | 0 | 9 | 230 | 175 |
| Misc. (Wash., Ore.) | 3 | 0 | 0 | 0 | 3 | 0 | 2,230 | 79 | 65 | 3 | 0 | 0 | 0 | 3 | 73 | 34 |
| Total U. S. | 807 | 338 | 32 | 68 | 333 | 36 | 3,304,002 | 24,070 | 28,110 | 220 | 16 | 4 | 5 | 195 | 5,314 | 5,241 |
| Prev. week | 945 | 381 | 28 | 117 | 370 | 49 | 3,924,984 | ..... | ..... | 206 | 12 | 3 | 9 | 182 | ..... | ..... |
| Cum. 1960 | 24,070 | 11,233 | 733 | 1,966 | 9,419 | 719 | 104,606,308 | ..... | ..... | 5,314 | 464 | 60 | 174 | 4,616 | ..... | ..... |
| Cum. 1959 | 28,110 | 14,318 | 692 | 2,016 | 10,329 | 755 | 116,025,170 | ..... | ..... | 5,241 | 516 | 76 | 158 | 4,491 | ..... | ..... |
| Western Canada | 34 | 19 | 0 | 6 | 9 | 0 | 182,004 | 1,169 | 1,356 | 10 | 2 | 0 | 1 | 7 | 332 | 406 |

## ROTARY RIGS OPERATING IN UNITED STATES




## CRUDE-OIL STOCKS




## CRUDE-OIL STOCKS BY STATES OF ORIGIN*
(Thousands of barrels)

| | 7-16-60 | 7-9-60 | 7-18-59 |
|---|---|---|---|
| Pennsylvania | 2,116 | 2,123 | 2,506 |
| Other Appalachian | 1,806 | 1,779 | 1,936 |
| Illinois, Indiana, Michigan | 9,743 | 9,736 | 10,197 |
| Nebraska and North Dakota | 2,923 | 2,766 | 2,789 |
| Kansas | 9,380 | 9,312 | 10,381 |
| Oklahoma | 17,853 | 17,609 | 17,026 |
| Arkansas | 1,999 | 2,049 | 2,011 |
| Louisiana | 17,632 | 17,876 | 19,692 |
| North | 2,863 | 3,045 | 3,174 |
| South | 14,769 | 14,831 | 16,518 |
| Mississippi, Alabama, Florida | 1,899 | 1,634 | 2,609 |
| New Mexico | 7,861 | 8,200 | 8,054 |
| Texas | 103,499 | 103,973 | 117,532 |
| East Texas | 8,023 | 8,372 | 8,991 |
| West Texas | 48,094 | 47,470 | 57,157 |
| Texas Gulf | 17,018 | 17,516 | 19,722 |
| Other Texas | 30,364 | 30,615 | 31,662 |
| Wyoming | 17,041 | 17,720 | 15,946 |
| Other Rocky Mountain | 9,846 | 9,762 | 9,260 |
| California | 28,382 | 28,486 | 32,128 |
| Foreign | †13,937 | 16,095 | 18,300 |
| Total | **245,917** | 249,120 | 270,367 |

*Bureau of Mines. †Includes 3,381,000 bbl. in California.

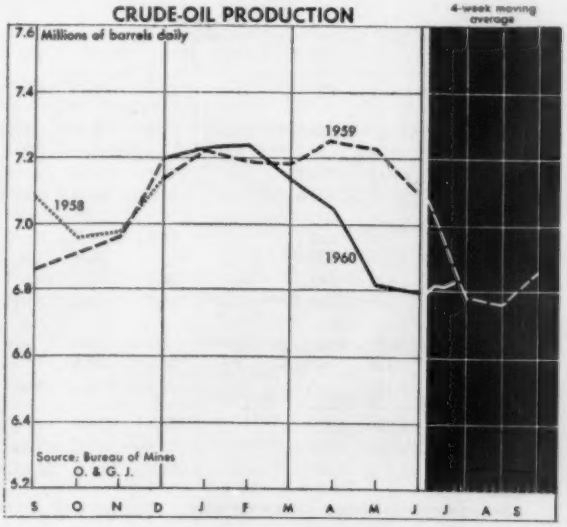
## DAILY AVERAGE PRODUCTION FOR WEEK

| | July 23, 1960 | | | July 16 |
|---|---|---|---|---|
| | Crude oil | Lease condensate | Total | total |
| Alabama | 17,900 | ..... | 17,900 | 17,800 |
| Arkansas | 78,525 | 125 | 78,650 | 78,650 |
| California | 837,900 | ..... | 837,900 | 836,600 |
| Colorado | 127,000 | ..... | 127,000 | 128,500 |
| Eastern | 40,200 | ..... | 40,200 | 40,800 |
| Florida | 1,000 | ..... | 1,000 | 1,000 |
| Illinois | 214,000 | ..... | 214,000 | 214,500 |
| Indiana | 32,600 | ..... | 32,600 | 32,500 |
| Kansas | †302,415 | ..... | †302,415 | †283,575 |
| Kentucky | 62,600 | ..... | 62,600 | 62,400 |
| Louisiana | 943,500 | 118,300 | 1,061,800 | 1,061,800 |
| North | 107,500 | 5,800 | 113,300 | 113,300 |
| South | 836,000 | 112,500 | 948,500 | 948,500 |
| Michigan | 41,500 | ..... | 41,500 | 41,500 |
| Mississippi | 134,000 | 3,600 | 137,600 | 137,600 |
| Montana | 82,200 | ..... | 82,200 | 84,100 |
| Nebraska | 67,400 | ..... | 67,400 | 66,900 |
| Nevada | 100 | ..... | 100 | 100 |
| New Mexico | 284,000 | 7,000 | 291,000 | 291,000 |
| North Dakota | 58,400 | ..... | 58,400 | 57,800 |
| Oklahoma | †519,200 | ..... | †519,200 | †504,300 |
| Texas | 2,349,000 | 85,800 | 2,434,800 | 2,434,800 |
| Dist. 1 | 41,000 | 2,500 | 43,500 | 43,500 |
| Dist. 2 | 97,000 | 8,100 | 105,100 | 105,100 |
| Dist. 3 | 310,000 | 36,000 | 346,000 | 346,000 |
| Dist. 4 | 161,000 | 17,000 | 178,000 | 178,000 |
| Dist. 5 | 26,000 | 300 | 26,300 | 26,300 |
| Dist. 6 | 101,000 | 8,900 | 109,900 | 109,900 |
| East Texas field | 122,000 | ..... | 122,000 | 122,000 |
| Dist. 7-B | 126,000 | 150 | 126,150 | 126,150 |
| Dist. 7-C | 116,000 | 3,300 | 119,300 | 119,300 |
| Dist. 8 | 949,000 | 7,000 | 956,000 | 956,000 |
| Dist. 9 | 193,000 | 1,700 | 194,700 | 194,700 |
| Dist. 10 | 107,000 | 850 | 107,850 | 107,850 |
| Utah | 92,500 | ..... | 92,500 | 97,900 |
| Wyoming | 344,600 | ..... | 344,600 | 336,800 |
| Others | ‡1,350 | ..... | ‡1,350 | ‡1,350 |
| Total U. S. | 6,631,890 | 214,825 | **6,846,715** | 6,812,275 |
| Change from prev. week, up | ..... | ..... | **34,440** | ..... |
| Canada | †531,000 | ..... | †531,000 | †477,400 |

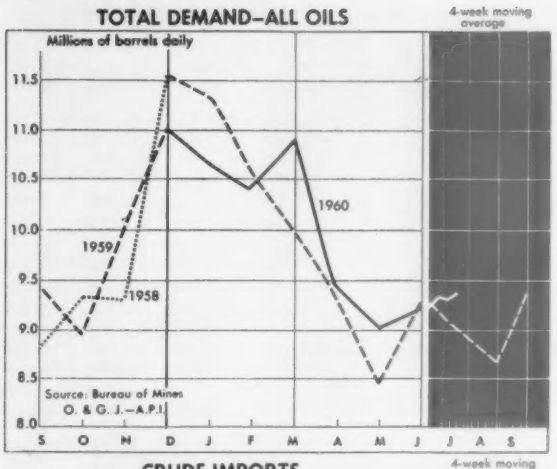
Total U. S. Prod. Jan. 1-July 23 ..... 1,438,200,200
Same period last year (crude plus cond.) ..... *1,458,516,200 bbl.

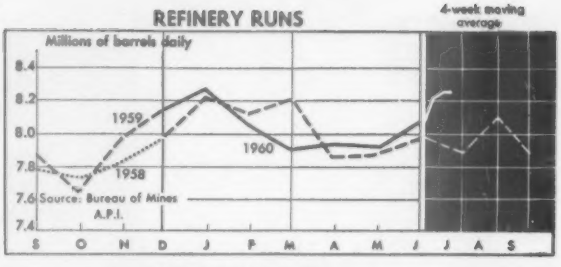
*Includes 37,395,300 bbl. condensate. †Week ended previous Monday. ‡Alaska and South Dakota.

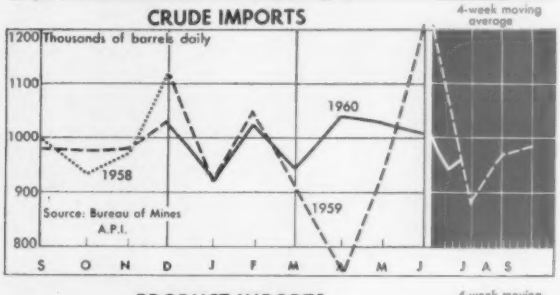
## CRUDE-OIL PRODUCTION

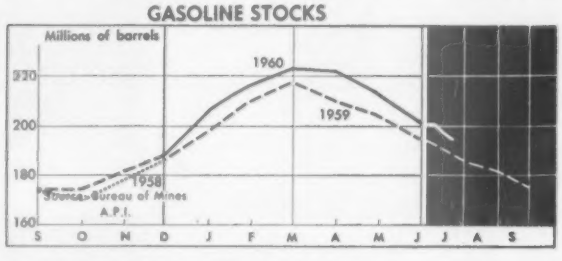


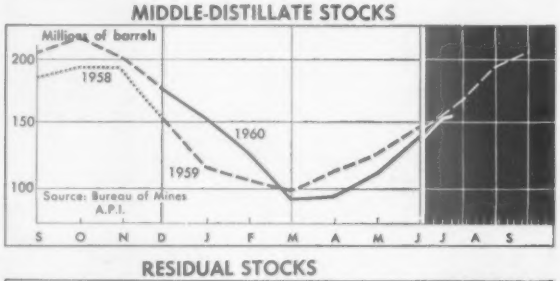
## REFINING

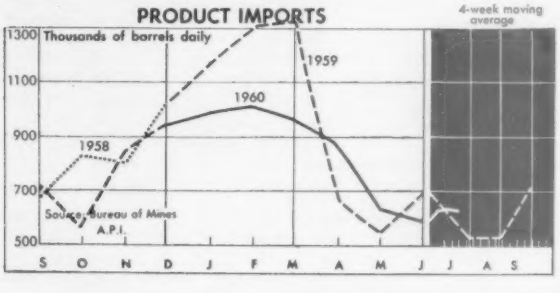


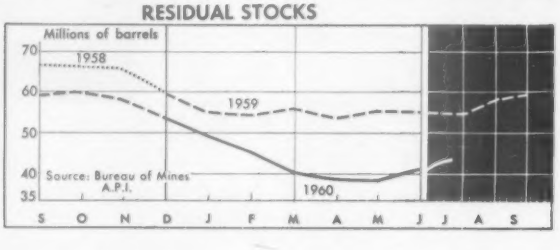




### API REFINERY REPORT—JULY 22, 1960

(Thousands of barrels)

| District— | Daily avg. runs | Daily average production: Gaso.* | Kero. | Dist. | Resid. | Stocks‡: Gaso.† | Kero. | Dist. | Resid. | Bureau of Mines, July 1959: Daily avg. runs | Daily average production: Gaso.* | Kero. | Dist. | Resid. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| East Coast | 1,212 | 547.4 | 66.1 | 322.3 | 150.6 | 44,382 | 11,018 | 43,869 | 12,478 | 1,101 | 522.0 | 13.3 | 325.6 | 160.0 |
| Appalachian: | | | | | | | | | | | | | | |
| District 1 | 82 | 34.6 | 4.4 | 14.1 | 6.9 | 6,176 | 682 | 2,756 | 441 | 92 | 40.8 | 3.0 | 21.5 | 4.2 |
| District 2 | 108 | 58.7 | 1.3 | 23.0 | 8.7 | 2,998 | 327 | 1,302 | 259 | 107 | 59.5 | 1.1 | 20.5 | 8.3 |
| Ind., Ill., Ky. | 1,432 | 770.6 | 72.0 | 382.9 | 138.1 | 34,180 | 5,961 | 21,797 | 5,320 | 1,413 | 737.5 | 68.5 | 282.6 | 119.8 |
| Minn., Wis., Dak. | 125 | 56.1 | 8.4 | 29.7 | 16.6 | 6,887 | 1,387 | 5,635 | 600 | 115 | 55.5 | 7.7 | 26.5 | 11.1 |
| Okla., Kans., Mo. | 734 | 386.4 | 11.4 | 177.9 | 22.6 | 17,468 | 1,540 | 10,584 | 1,079 | 709 | 386.8 | 11.5 | 166.3 | 18.5 |
| Inland Texas | 301 | 220.7 | 7.3 | 58.6 | 17.7 | 6,530 | 553 | 1,612 | 2,513 | 294 | 229.6 | 6.6 | 49.3 | 24.8 |
| Tex. Gulf Coast | 1,921 | 978.0 | 121.2 | 425.1 | 96.0 | 24,402 | 3,209 | 13,847 | 4,343 | 1,737 | 914.2 | 56.5 | 405.9 | 127.8 |
| La. Gulf Coast | 622 | 365.7 | 56.7 | 124.4 | 40.0 | 10,671 | 1,847 | 5,688 | 1,434 | 712 | 395.2 | 47.2 | 166.2 | 44.7 |
| N. La. and Ark. | 98 | 65.9 | 4.0 | 16.6 | 4.1 | 4,992 | 1,070 | 1,621 | 136 | 69 | 28.5 | 1.8 | 14.0 | 4.2 |
| Rocky Mountain: | | | | | | | | | | | | | | |
| New Mexico | 26 | 12.4 | 0.7 | 4.7 | 3.0 | 674 | 50 | 108 | 11 | 27 | 13.8 | 0.5 | 5.2 | 2.3 |
| Other Rky. Mt. | 318 | 143.9 | 4.3 | 70.0 | 38.6 | 5,984 | 351 | 2,418 | 850 | 327 | 144.8 | 3.1 | 67.3 | 35.1 |
| West Coast | 1,225 | 519.0 | 36.3 | 219.4 | 271.4 | 29,435 | 1,538 | 12,683 | 14,024 | 1,178 | 547.7 | 3.9 | 167.8 | 262.1 |
| July 22, 1960 | 8,204 | 4,159.4 | 394.1 | 1,768.7 | 814.3 | 194,779 | 29,533 | 123,920 | 43,488 | 7,881 | 4,075.9 | 224.7 | 1,718.7 | 822.9 |
| July 15, 1960 | 8,257 | 4,290.1 | 352.7 | 1,853.1 | 828.6 | 197,241 | 29,157 | 121,427 | 43,013 | ..... | ..... | ..... | ..... | ..... |
| July 24, 1959 | 7,952 | 4,107.1 | 293.7 | 1,686.0 | 901.9 | 188,157 | 28,964 | 134,463 | 54,789 | ..... | ..... | ..... | ..... | ..... |

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

# Crude-Oil Prices

**GRAVITY SCHEDULE**

| | Signal Hill, Calif. | Oklahoma | West Tex. (sour) | West Tex. (Inter.) | No.* Texas | Texas Refugio Light | Bayou Sale (La.) | Denver Julesburg | Wyo. (sour) |
|---|---|---|---|---|---|---|---|---|---|
| 14-14.9 | $1.76 | .... | .... | .... | .... | .... | .... | .... | .... |
| 15-15.9 | 1.84 | .... | .... | .... | .... | .... | .... | .... | $1.81 |
| 16-16.9 | 1.92 | .... | .... | .... | .... | .... | .... | .... | 1.86 |
| 17-17.9 | 2.00 | .... | .... | .... | .... | .... | .... | .... | 1.91 |
| 18-18.9 | 2.08 | .... | .... | .... | .... | .... | .... | .... | 1.96 |
| 19-19.9 | 2.16 | .... | .... | .... | .... | .... | .... | .... | 2.01 |
| 20-20.9 | 2.24 | $2.49 | $2.35 | $2.61 | $2.29 | $2.95 | $2.90 | $2.58 | 2.06 |
| 21-21.9 | 2.32 | 2.52 | 2.38 | 2.63 | 2.33 | 2.97 | 2.92 | 2.60 | 2.11 |
| 22-22.9 | 2.39 | 2.55 | 2.41 | 2.65 | 2.37 | 2.99 | 2.94 | 2.62 | 2.16 |
| 23-23.9 | 2.46 | 2.58 | 2.44 | 2.67 | 2.41 | 3.01 | 2.96 | 2.64 | 2.21 |
| 24-24.9 | 2.53 | 2.61 | 2.47 | 2.69 | 2.45 | 3.03 | 2.98 | 2.66 | 2.26 |
| 25-25.9 | 2.60 | 2.64 | 2.50 | 2.71 | 2.49 | 3.05 | 3.00 | 2.68 | 2.31 |
| 26-26.9 | 2.67 | 2.67 | 2.53 | 2.73 | 2.53 | 3.07 | 3.02 | 2.70 | 2.36 |
| 27-27.9 | 2.74 | 2.70 | 2.56 | 2.75 | 2.57 | 3.09 | 3.04 | 2.72 | 2.49 |
| 28-28.9 | 2.81 | 2.73 | 2.59 | 2.77 | 2.61 | 3.11 | 3.06 | 2.74 | 2.54 |
| 29-29.9 | 2.87 | 2.76 | 2.62 | 2.79 | 2.65 | 3.13 | 3.08 | 2.76 | 2.59 |
| 30-30.9 | 2.93 | 2.79 | 2.65 | 2.81 | 2.69 | 3.15 | 3.10 | 2.78 | 2.63 |
| 31-31.9 | 3.00 | 2.82 | 2.68 | 2.83 | 2.73 | 3.17 | 3.12 | 2.80 | 2.67 |
| 32-32.9 | 3.06 | 2.85 | 2.71 | 2.85 | 2.77 | 3.19 | 3.14 | 2.82 | 2.71 |
| 33-33.9 | 3.12 | 2.88 | 2.74 | 2.87 | 2.81 | 3.21 | 3.16 | 2.84 | 2.75 |
| 34-34.9 | 3.17 | 2.91 | 2.77 | 2.89 | 2.85 | 3.23 | 3.18 | 2.86 | 2.79 |
| 35-35.9 | 3.22 | 2.94 | 2.80 | 2.91 | 2.89 | 3.25 | 3.20 | 2.88 | 2.83 |
| 36-36.9 | 3.27 | 2.97 | 2.83 | 2.93 | 2.93 | 3.27 | 3.22 | 2.90 | 2.87 |
| 37-37.9 | 3.31 | 2.99 | 2.86 | 2.95 | 2.95 | 3.29 | 3.24 | 2.92 | 2.89 |
| 38-38.9 | .... | 3.01 | 2.89 | 2.97 | 2.97 | 3.31 | 3.26 | 2.94 | 2.91 |
| 39-39.9 | .... | 3.03 | 2.92 | 2.99 | 2.99 | 3.33 | 3.28 | 2.96 | 2.93 |
| 40-44.9 | .... | 3.05 | 2.95 | 3.01 | 3.01 | 3.35 | 3.30 | 2.98 | 2.95 |

*Cooke, Grayson, Montague.

## Flat Prices

| | |
|---|---|
| **Louisiana:** | |
| Sweet Lake | $3.00 |
| **Texas:** | |
| East Texas | 3.05-3.25 |
| Conroe | 3.23-3.53 |
| Van | 3.08 |
| **Pennsylvania Grade:** | |
| Bradford | $4.70 |
| Middle District | 4.52 |
| Southwest Pennsylvania | 4.25 |
| West Virginia | 4.07 |
| Buckeye Grade | 3.98 |
| **Illinois Basin** | **2.85-3.00** |

## Foreign

| | |
|---|---|
| **Middle East, Persian Gulf (cargoes f.o.b. lifting port):** | |
| Arabian, about 34°, Ras Tanura | $1.90 |
| Iranian, 34.0°-34.9°, Bandar Masur | 1.86 |
| Iranian, 34.0°-34.9°, Abadan | 1.81 |
| Iraq, 36.0°-36.9°, Fao | 1.82 |
| Kuwait, 31.0°-31.9°, Mina-al-Ahmadi | 1.67 |
| Qatar, about 41°, Um Said | 2.05 |
| **Middle East, E. Mediterranean:** | |
| Arabian, about 35°, Sidon | 2.29 |
| Iraq, about 35°, Tripoli, Banias (Grade A) | 2.29 |
| **Far East (cargoes, f.o.b. Lutong, Sarawak):** | |
| Seria Light, 37° | 2.57 |
| **Canada:** | |
| Leduc-Woodbend | $2.53 |
| Redwater (Alta.) | 2.42 |
| Smiley (Sask.) | 2.18 |
| Pembina | 2.38 |
| **Venezuela:** | |
| Cumarebo, 47°-47.9°, Tucupido | 3.34 |
| San Joaquin, 40°-40.9°, Puerto La Cruz | 3.08 |
| Oficina, 35°-35.9°, Puerto La Cruz | 2.80 |
| Tia Juana medium, 26°-26.9°, Amuay* | 2.30 |
| Quiriquire, 16.0°-16.4°, Caripito | 2.10 |
| Lagunillas heavy, flat, Las Piedras* | 2.10 |
| Bachaquero, flat, 15°-16°, Las Piedras* | 1.88 |

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

## Tanker Rates (Long Ton)

(Latest reported spot fixtures)

| | |
|---|---|
| ★ Gulf-NY, clean (ATRS+5.0%) | $2.99 |
| ★ Carib.-NY, clean (ATRS−42.5%) | 1.58 |
| ★ Carib.-NY, dirty (ATRS−55.0%) | 1.24 |
| ★ PG-NY, dirty (USMC−70.0%) | 3.81 |

★Denotes change from previous week.

# Refined-Product Prices

Following quotations are realistic spot prices for refined products moving interstate on Wednesday each week. They may differ from refiners' posted prices and should not be considered as postings.

Light-product prices are in cents per gallon. Residual and crude prices are dollars per barrel. Crude prices are at the well unless otherwise listed.

## Gasoline*

| | |
|---|---|
| **Mid-Continent (Group 3):** | |
| Regular (91 octane) | 11.75-12.00 |
| Premium (99 octane) | 14.50-14.75 |
| Natural gasoline (26-70) | 4.5 |
| Breckenridge | 4.0 |
| **Gulf Coast (cargoes for coastwise or export movements):** | |
| ★ Regular (90 octane) | 10.75-11.00 |
| ★ Regular (92 octane) | 11.00-11.25 |
| ★ Premium (98 octane) | 12.00-12.25 |
| **California (rack) Los Angeles:** | |
| Regular (88 octane) | 11.65-12.15 |
| Premium (94 octane) | 12.65-13.15 |
| Premium (100 octane) | 14.00-14.65 |
| **Caribbean area (cargoes):** | |
| ★ Regular (87 octane) | 10.125-10.25 |
| ★ Premium (97 octane) | 11.75 |

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

## Kerosine and Distillate

| | |
|---|---|
| **Mid-Continent (Group 3):** | |
| ★ Kerosine 42-44 | 9.50-9.75 |
| ★ Diesel oil (58 d.i. and above) | 9.25-9.50 |
| ★ Distillate No. 1 | 9.25-9.50 |
| ★ Distillate No. 2 | 8.25-8.50 |
| **Gulf Coast (cargoes):** | |
| Kerosine 41-43 | 9.00-9.25 |
| Distillate No. 2 | 8.25 |
| **New York Harbor (barges):** | |
| Kerosine 41-43 | 10.05 |
| Distillate No. 2 | 9.05 |
| Diesel fuel, 48-52 d.i. | 9.35 |
| **Caribbean area (cargoes):** | |
| Distillate No. 2 | 8.125 |

## Residual Fuel (Bbl.)

| | |
|---|---|
| **Mid-Continent (Group 3):** | |
| Residual fuel (max. 1% S) | $1.90 |
| **Gulf Coast (cargoes):** | |
| Bunker C fuel | 2.35 |
| **New York Harbor (barges):** | |
| Bunker C fuel | 2.52 |
| **Caribbean (cargoes):** | |
| Bunker C | $2.10 |
| **California (rack):** | |
| Bunker C fuel, Los Angeles | $2.15 |

★Denotes change from previous week.

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*for the oil and gas industry*

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## FOR SALE EQUIPMENT

REBUILT RA-3 Clark Compressor. Advise specifications your requirement: will quote suitably cylindered. Sperbeck Steel, Inc., Box 19351, Houston. Phone: HO-81317.

IDECO H-40-D Double Drum Drawworks, with Automatic Catheads, 22" Hydratarder, Right Angle Rotary Drive, two Control Consols and #525 Input Shaft Powered by GMC 6-71 #12107 Twin, with Complete Safety Shut Downs and Alarms, 96' Ideco 240,000# Hook-Load Kwik Lift Mast, complete with Guylines, Platforms, Lights, and Hydraulic System for Raising and Lowering. All Mounted on 8 Wheel Ideco H. D. Rambler Trailer. Excellent Condition. Priced at $30,000.00 F.O.B. our Bakersfield Yard. Balance of additional necessary equipment to complete if desired. Contact E. W. Clark, c/o Bender Oil Operations, P.O. Box 52, Bakersfield, California. Telephone FAirview 4-4961.

## LIQUIDATION

**at ESSO REFINERY Balto., Md.**

### TOWERS

10' x 145'—125 PSI 58 trays
9'6" x 121'—325 PSI 30 trays
8'6" x 103'—185 PSI 24 trays
7'0" x 82'— 75 PSI 30 trays
6'0" x 80'—300 PSI 30 trays
4'0" x 44'—150 PSI 12 trays
3'6" x 36'—400 PSI 12 trays
2'6" x 52'—360 PSI 22 trays
2'2" x 57'— 85 PSI 4 trays

### HEAT EXCHANGERS—CONDENSERS

Steel Tube ..... 7,500 to 100 sq. ft.
Adm. Tube ..... 3,500 to 236 sq. ft.
Cu Ni Tube ..... 2,330 to 308 sq. ft.
S. S. Tube ..... 1,000 to 170 sq. ft.

BLOWERS—11,880 CFM @ 11 PSIG
INSTRUMENTS—Controllers, Recorders, Indicating and Transmitting
MOTORS—10 HP to 500 HP XP
PIPE CHROME—3¼" to 14" OD
PUMPS—Hot Oil, Steam, Centrifugal
REACTOR—8' x 32'6" OA
REBOILERS—2,700 to 450 sq. ft.
TRANSFORMERS—5 KVA to 333 KVA
VALVES—Diaphragm, Butterfly Slide and Pressure Regulating
VESSELS PRESSURE—3' to 12' Dia.

PETRO CHEM FURNACE
1.9 MILLION BTU NEW 1949

*WRITE FOR COMPLETE CATALOG*

**HEAT & POWER CO. INC.**

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310 Thompson Bldg., Tulsa 3, Okla.
Box 5203, Baltimore 24, Maryland

## FOR SALE EQUIPMENT

BARGAIN: Franks double drum portable drilling rig w/200,000# capacity 90' derrick, 7¼ x 12 G D Pump and all necessary tools for complete rotary rig inventory on request. Miers Well Service Inc., Box 325, Sterling, Colorado.

62 MILES OF 6-inch pipeline with booster pumping station sites and recorded rights of way, extending from Philadelphia refining area to a point 7 miles north of Lancaster, Pennsylvania. 44 miles are presently in product use and remainder can be returned to use after repairs. Box L-913, The Oil and Gas Journal, Tulsa, Oklahoma.

**2—ALDRICH VERTICAL TRIPLEX PUMPS**
**319 G. P. M. AT 1370 PSI**
**SUGGESTED USE: OIL FIELD FLOODING**

Specifications: Aluminum bronze barrel, porcelain plungers, S/S valve plates and seats, direct flow fluid-end design, built-in herringbone gearing. 300 HP, 1800 RPM, 3/60/440 outdoor type motors (motors optional).
Purchased 1956. Good condition—only used for short time—presently installed near San Francisco, Calif. Photo on request.

E. I. DU PONT DE NEMOURS & CO., INC.
WILMINGTON, DELAWARE
SURPLUS MATERIALS DIVISION
PHONE—PRospect 4-3679.

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WELL DRILLS, core drills. Everything for well and core drilling. New and used equipment at money saving prices. Everything in supplies. Nationwide sales. Send for bulletins—Pressey & Son, Pueblo, Colorado.

FOR SALE in excellent condition 8,353 ft. 3½" OD 13.30 grade D drill pipe with 3½" Hydril IF double boxes and twin pin subs; 1,898 ft. 3½" OD 13.30# grade D drill pipe with 3½" Hughes flush joints tool joints, w/lift plugs. System Oil & Gas Company, Meadows Building, Dallas Texas, Telephone EM 8-2202.

**NEW CROLOY 5 HEATER TUBES**

Priced at ½ New Cost

**Must Move at Once**

14—3¾" x ⅜" wall x 44' long
63—4" x ¾" wall x 28' long
10—4" x ¾" wall x 32' long
50—4" x ½" wall x 32' long
3—3" x ½" wall x 42' long
42—6" x ½" wall x 27' to 47' long

**HEAT & POWER CO., INC.**
60 E. 42nd St., N. Y. 17, N. Y.
310 Thompson Bldg., Tulsa 3, Okla.

**LIQUIDATION AT ESSO STANDARD OIL REFINERY, BATON ROUGE**

400 HP Compressors; Towers; Vessels; Heat Exchangers; Pumps.

For further information contact:

Chemical & Refinery Equipment Co.
Box 19351, Houston, Texas
Phone HO 8-1317

OR

Louisiana Steel Compress Co.
Box 566, Baton Rouge, La.
Phone DI 8-5371

## FINAL CLEAN-UP SALE

**DESTREHAN, LA.**

### HEAT EXCHANGERS

Steel Tube: 3280, 2100, 1200, 950 sq. ft.
Adm. Tube: 2800, 2700, 2600, 2100, 1700, 1500, 1375, 1250, 1100, 1000, 920, 650 sq. ft.
20 Fin Tubes: 50-190 sq. ft.

### VESSELS & TOWERS

8' x 75' 20 Tray 25#
7½' x 56' 20 Tray 35#
36' x 58' 30 Tray 154#
3' x 47' 20 Tray 120#
18" x 32' 15 Tray 130#
2' x 30' packed 50#
4' x 36' packed 210#
10' x 55' 60#
8' x 43' 60#
6' x 42' 200#
6' x 20' 40#
12' x 43' 25#

2—IR Turbo Exhausters 15,300 & 17,000 CFM 4.85 PSIG with Turbine Drives.
1—Clark Centrifugal Compressor 10,000 CFM—240 PSI discharge.

### STORAGE TANKS & SPHERES

15 Storage Tanks welded: 29,000, 10,000, 5,000, 3,750 barrel.
5 Spheres-Spheroids: 5,000, 10,000 barrel.

### PUMPS

Hot Oil: 1" through 6"; 50-400 gpm 100-3,000 ft. hd.
Boiler Feed: 190 gpm 1,500' hd.
Cooling Tower: 7,000 gpm 120' hd.
River Water Sump: 1,000 gpm 59' hd.
Deep Well: 1,700 gpm 90' hd.

### OTHER FEATURED ITEMS

1 Lummus: 35 mil. BTU furnace
2 Petro-Chem. Furnace: 1¼ mil. BTU
2 B&W Boilers: 70,000# per hr.-450#
1 IR-XVG-4 Compressor
1 Worth LT-6 Compressor
1 Ethyl Lead Plant

*WIRE!—PHONE! FOR COMPLETE INFORMATION*

**BRILL** EQUIPMENT COMPANY—DESTREHAN, LA.—NORCO 6571
4101 San Jacinto St. Houston 4, Texas, JA 6-1351
35-65 Jabez St. Newark 5, N. J., MA 3-7420

## FOR SALE EQUIPMENT

$150.00 FOR 20" Spider with slips only—Near Tulsa. GI 7-4750, 309 Thompson Bldg., Tulsa, Oklahoma.

**—PIPE—**

| | | |
|---|---|---|
| 2,000,000 ft. | 2" | 3.50# to the ft. |
| 1,000,000 ft. | 3" | 7.70# |
| 1,000,000 ft. | 4" | 10.98# |
| 500,000 ft. | 6" | 19.80# |
| 200,000 ft. | 8 5/6" | 28# |
| 400,000 ft. | 10¾" | 35# |
| 75,000 ft. | 12¾" | 40# |
| 10,000 ft. | 16" | 42# |

All No. 1 Grade plain end and cleaned.

**INDIANA-OHIO PIPE CO.**
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Columbus 19, Ohio
Phone CL 3-5527

**LIQUIDATION**
at Koppers Co.—Monaca, Penna.
Oil Cracking Plant—1949

TOWERS, 14 ft. to 99 ft.
EXCHANGERS, 75 sq. ft. to 6,370 sq. ft.
CENT. PUMPS, 5 to 4,000 GPM
FURNACES, Petroleum, Alcorn and B & W types.
TANKS, 500 to 850,000 gal.
VALVES, from 1" to 18" Forged Steel, Approx. 3,000 to 4,000
COMPRESSORS, Ingersol-Rand, steam, type XPV.
INSTRUMENTS, Foxboro, Leeds & Northrop.

(FOR SALE—as a plant or by item. Contact Rochester-Coal-Trucking & Contracting Company)

Rochester Coal
Trucking & Contracting Company
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**FOR SALE**

200,000 Ft. 3½" O.D. Seamless A-1 Used Locomotive Tubes, Clean Inside and Out. Roller-Beveled Ends. 18' and over in lengths.
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**COLUMBUS STEEL SUPPLY**
1000 BONHAM AVE. • AX 4-4461
COLUMBUS, OHIO

# ANSWER

## to Worthington Hidden Value Puzzle

The fictitious "hidden value" page 51 is, of course, the "Full Floating Wrist Pin" in the piston. This construction is found only on light duty compressors with single acting cylinder construction.

Because all Worthington horizontal compressors are heavy duty machines, they are built with the crankshaft, connecting rod and crosshead linkage system illustrated above. It changes rotary shaft motion to linear piston motion without side thrusts on the cylinder walls. Thus wear is reduced and compressor life increased. Worthington Corporation.

## FOR SALE EQUIPMENT

DOUBLE DRUM Spudder on IHC truck. Cooper E 563-42-36 complete. New lines. Box 736, Great Bend, Kansas. GLadstone 3-8817.

TWO PERFORATING trucks with lines completely equipped with or without radioactivity logging equipment. These trucks are in excellent condition and ready for immediate use. Box L-897, The Oil and Gas Journal, Tulsa, Oklahoma.

7¼—14 (F x K) Gardner Denver, late type, skid mounted, Mud Pump. Power and Fluid ends like new. Completely gone through. 4 sets liners, extra valves, etc. Sand blasted and primed. Will paint your color. $7,500.00. Located in Billings. Call or write Luke Wise, Community Gas & Oil Co., Billings, Montana.

3—INTERNATIONAL K11 tandem trucks equipped with triplex HP acid pumps, tanks, flexible hose and connections. These pumpers excellent for many lease service operations. Selling price based on salvage value, $5000.00 and up. Terms or lease purchase for qualifying buyers. Write or call C. D. Core, P. O. Box 47, Phone FR 9-5132, Seguin, Texas.

FOR SALE—Model 33C Walker Neer service and drilling unit, mounted on International tandem truck, 140 HP Waukesha engine, heavy duty 8" 65' double mast, 4000' ⅞" drilling line, 5,000 ½" sand line, 400' ¾" casing line, steel dog house, light plant mounted on truck and some light drilling tools. Machine and truck in first class condition has drilled very little new hole. One and one half years old and will sell for less than half of its cost. P. L. Crandell Company, 1404 Wilco Bldg., Midland, Texas.

NEAR NEW National 110 Rig with three PTDS-8 Engines, Gyrol Drive, "Runaround" Rotary Drive, two taildriven G-700 National Pumps, C-250 Pump with GMC-Power, 142' L. C. Moore 1,025,000# Mast, National "F" Hook-Block #654F450, National N-815 Swivel, National MS-27½ Table, M-D Recording Indicator with Sensator and Torque Gauge, Six Bender Drill Pipe Bins and Racks, Casing Racks, 28 Drill Collars, one 410 Bbl. Storage Tank, two 35 KW Generators, Utility House with Panel with C-H "Arc-Tite" Connections. Shop with 5,000 gallon Diesel Tank Mounted Topside, Tool House 20' x 7'6" x 10' Skid Mounted, 7'6" x 7'6" x 7'6" Drillers House, Totco, Casing Tools, Misc. Tools, etc. Rig located at Southeastern U. S. Port on Dock. Six months total use, Drilled three wells since new, Excellent Condition and Priced to Sell. Contact E. W. Clark, c/o Bender Oil Operations, P. O. Box 52, Bakersfield, California. Telephone FAirview 4-4961.

RIG, TRACTORS, crane for sale: 60 Keystone same as new, spool 5,000 feet drilling line, hitch for moving has 4,500 ft. new line. D-7 Caterpillar with oil field winch and blade, excellent. TD-14 International tractor, oil field winch and blade Lorain Motor crane, clam bucket with Auto Car 10 wheel drive truck, excellent. Truck winch with power takeoff. All items priced for immediate sale. Harold Hardwick, Burkesville, Ky.

## EQUIPMENT WANTED

WE ARE interested in the purchase of your depleted wells for salvage. Also, used casing, tubing, units, tanks, etc. Must be in Kansas area. The Buckeye Supply Company of Kansas, Inc., 105 S. Main, El Dorado, Kansas.

## HELP WANTED

OUTSTANDING OPPORTUNITY for highest caliber reservoir engineer with leading international consulting firm. Development of fundamental reservoir mechanics for application in major field studies will be primary responsibility. Please reply giving full details of background and experience. Location, Southwest: Replies strictly confidential. Box L-926, The Oil and Gas Journal, Tulsa, Oklahoma.

**Expanding petro-chemical company has several opportunities for qualified technical graduates or production men with several years experience in chemical plant operation for responsible supervisory positions. Please send resume including salary requirements, educational background, and experience to**
**P. O. Box 109 Marshall, Illinois**

## HELP WANTED

CONSULTING ENGINEERING Firm with offices in U. S. and Canada has an opening for a young personable engineer, which offers opportunity for advancement. B.S. in chemical engineering and five years experience in gas processing industry minimum requirements. Advanced degree preferred. Knowledge of production or marketing problems in oil industry helpful. Permanent location Calgary, Alberta. Starting salary commensurate with experience and ability. Send resume of experience, salary requirements, and picture. Box L-920, The Oil and Gas Journal, Tulsa, Oklahoma.

NEW OIL JOB Directory, foreign and domestic, showing where to apply for jobs. 500 selected producing, refining, butane and pipeline companies. Nationwide, $5.00 cash. OIML Co., Box 2603, Tulsa, Oklahoma.

EXPLOITATION GEOLOGIST with proved reservoir engineering experience. Job location in Libya with company already owning proved reserves. Minimum five years experience, previous foreign experience desirable. Box L-927, The Oil and Gas Journal, Tulsa, Oklahoma.

**REFINERY MANAGER**
**LATIN AMERICA**

Require chemical engineering background and refinery operating and administrative experience. Knowledge of modern refinery processes. Send detailed resume of background and qualifications.

**Box L-930, The Oil and Gas Journal, Tulsa, Oklahoma**

**RESEARCH IN PETROLEUM DRILLING**

Highly creative BS or MS with 2 to 5 years of experience either in drilling research or drilling operations for applied research and liaison with field activities. Excellent opportunity for professional development in a stimulating environment where advancement is provided on a merit basis for careers in science, technology or administration with equivalent levels of renumeration. The laboratories are located in pleasant country surroundings about 50 miles northwest of downtown Chicago.

**Please send resume to:**
**Mr. D. M. Dawes**
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**Research Center, Box 438**
**Crystal Lake, Illinois**

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**PETROLEUM**
**PRODUCTION**

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A chemical background with general application in **petroleum production** or specific experience in **secondary recovery water treating.**

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Our Company is **expanding** in a number of **diversified** markets. If you are interested in playing a part in our **sales and development** approach to the petroleum market, interviews can be arranged locally by phoning our offices in advance or on specified dates for interviews as follows:

**Dallas, Mon. & Tues., Aug. 8 & 9**
**Phone TAylor 3-2804**
**Houston, Wed. & Thurs., Aug. 10 & 11**
**Phone JAckson 9-6215**
**or write:**
**John W. Church, Personnel Manager**
**Armour Industrial Chemical Company**
**110 N. Wacker Drive,**
**Chicago 6, Illinois**

HELP WANTED

## NATURAL GASOLINE PLANT ENGINEER

Oil Company has immediate need for a qualified man with chemical and/or mechanical engineering degree. Require at least five years experience in all phases of natural gasoline plant operation and treatment of sour gas. Duties involve general plant engineering including laboratory control testing, plant performance tests, plant maintenance, and process trouble-shooting. All inquiries held confidential. Please send resume of background and experience to Box L-818, The Oil and Gas Journal, Tulsa, Oklahoma.

OFFICE MANAGER for Tulsa office and warehouse for established firm dealing in piston rings and packing. Internal combustion Engine experience desired. Engineering degree not required. Age preference 30-45. Box 4624, Tulsa, Oklahoma.

PROCESS ENGINEER WANTED by national manufacturing concern to locate in Tulsa area. Engineering degree required. Should be experienced in gas, gasoline plant layout. Write stating qualifications, experience, salary desired, etc. Box L-915, The Oil and Gas Journal, Tulsa, Oklahoma.

### MECHANICAL ENGINEER

Graduate mechanical engineer with a minimum of five years process industry experience in various phases of mechanical engineering. Send detailed resume of experience, education and salary requirements to:

**Personnel Manager**

**NATIONAL COOPERATIVE REFINERY ASSOCIATION**
**Box 770, McPherson, Kansas**

**PLANT FIRE MARSHALL**

Expanding oil company has created new position of Fire Marshall to take charge of its fire protection program at refinery and terminals in Perth Amboy, New Jersey, area. Duties will include fire training, supervision, inspection and equipment testing. Applicant must be at least a high school graduate, possess leadership qualities, have a good working knowledge of fire fighting and prevention techniques, with particular respect to oil and other flammable liquids, and have an intimate knowledge of appropriate fire fighting equipment. Age to 40. Salary commensurate with background and ability. Forward full resume and salary requirements to:

**Personnel Manager**
**Hess Trading & Transport, Inc.**
**Box 200, Port Reading, N. J.**

## ELECTRICAL ENGINEER

FOR
ELECTRONIC INSTRUMENT DESIGN
College Degree Required
Salary commensurate with ability and experience.

**General Geophysical Co.**
750 Houston Club Bldg.
Houston 2, Texas

HELP WANTED

CONSULTING ENGINEERING Company has opening for Reservoir Engineer. Degree plus five or more years general reservoir engineering experience required. General knowledge of geology desirable. Salary commensurate with experience. Please reply giving details of qualifications and ability. Replies strictly confidential. Box L-925, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER—with production experience and sales ability, wanted by Houston Production Equipment Manufacturer. Box L-892, The Oil and Gas Journal, Tulsa 1, Oklahoma.

SITUATIONS WANTED

MATERIALS CONTROL AUDITOR. Nine years oil company experience. Age 36. Will relocate. Thomas Crowe, 5307 So. Detroit, Tulsa.

EXPERIENCED GEOLOGIST. Desires to represent active independent on retainer or salary in Ark., La., Tex., area. Over 9 years well rounded major company experience. Hard worker. Resume furnished. Available now. Box L-922, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST-EMPLOYED, desires change to association with independent producer or consulting group. Ten years varied experience in prospect exploration, evaluation and development. Resume and references on request. Box L-928, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST—PILOT, 28, family, B.S. degree, four years major oil company, subsurface experience. Commercial license, instructor and instrument ratings. P. O. Box 493, Ardmore, Oklahoma.

AIRLINE CAPTAIN, 12,000 accident free hours. Capable of inaugurating and/or operating aviation division. Desire job in Middle East or South America. 5 years in Middle East. Capable of fulfilling any aeronautical logistics need. Presently employed by large international airline. Box L-931, The Oil and Gas Journal, Tulsa, Oklahoma.

**GEOLOGIST-PALEONTOLOGIST**

B.S. degree in Geology, 20 years major and independent oil company experience in geology in the U. S. Mid-Continent, California, South America, and the Middle East, familiar with micropaleostratigraphy, depositional environments, well correlations by lithology, foraminifera, ostracoda, pollen and spores, residues, all types of well logs, geologic and magnetic surveys, ideas for drilling wells, wants retainer.
216 Knox Building Enid, Oklahoma

LEASE AND DRILLING BLOCKS

FOR SALE—working interest in 160 acres offset to nice Bartlesville Sand, well 750 ft. Eastern Kansas. Box L-902, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING DEALS available Cambridge arch area of Nebraska. All based on subsurface geology. 10 to 12 possible pays. Economics excellent. Major company support on many. William V. Wade, Consulting Geologist, Box 772, McCook, Nebraska.

LEASE AND DRILLING BLOCKS

TWO TEXAS oil leases available: Crane County, S/239 acres, Section 18, block B-28, PSL; Upton County, all section 6, block 2½, TC RR survey, 77 acres; bonus priced $10.00 per acre, with $1.00 per acre annual delay rental, five years primary term leases, subject to my confirmation. Quickly write landowner: Jefferson G. Smith, 715 Littlefield Building, Austin 15, Texas.

WILDCATTERS: THIS IS IT! WALNUT, FALKNER, OWL CREEK STRUCTURE, four sites for 1,500 ft. oil. Eminent geologist's report. $2.00 acre reliable operators ONLY. SHALLOW OIL. 1369 Court, Memphis 4, Tennessee.

FOR SALE several thousand acres leases in Deep Edwards trend Texas. Scout Box 2274 Houston, Tex.

FOR SALE—304 acre government lease T. 5 S. R. 11 W. Cotton Co. Okla. Cash and override. Box L-924, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEATHAM COUNTY, Tennessee: 3,000 acre block, geologic structure on producing trend, geologist has mapped surface, report available; 60 cents per acre, ⅛ override, Box 2493. Salt Lake City, Utah.

382 ACRE LEASE western Irion County, Texas. ⅝ mile from San Andres production and 6 miles of 15 million barrel field. Expires January 1965. Good geology. Northwest ¼ survey 54 Washington Co. Ry. and east 222 acres survey 8 E. L. Rucker. $10.00 per acre or will make drilling deal. Roscoe Simpson, 12 South Irving St., San Angelo, Texas, Phone 3230.

SETTLED OIL PRODUCTION, 2 producing wells and SWD, drilled in 1925 making 10 BOPD, 6 miles from Tulsa, $18,000. Lease 3 miles from El Dorado, Kansas, 2 wells and SWD drilled in 1948 making 7 BOPD, $12,000. W. D. Short, Oxford, Kansas. Phone 120.

**OUTSTANDING GAS DEVELOPMENT OPPORTUNITY**

10,000 acres in Breathitt and Magoffin counties, Kentucky containing prominent structural features never tested. Two large tracts immediately offset by wells which gaged over 5,000,000 cu. ft. original open flow. Titles abstracted. Location map completed. All tracts individually surveyed. Geology available. Phone District 7-2877, Washington, D. C. or write: Oil Resources, Inc., 528 Union Trust Bldg., Washington, D. C.

## GAS & PETROLEUM LEASES FOR ASSIGNMENT

Have a number of Gas & Petroleum leases with unexpired terms up to fifteen (15) years located in a highly productive area in South Western Ontario.

*For particulars on these leases write:*

BOX L-929
THE OIL AND GAS JOURNAL
TULSA, OKLAHOMA

### MONEY RAISING

DRILLING—Wyoming, small amount money needed to complete hole, good deal. Write Box 236, Logan, Utah.

### REAL ESTATE

MEXICAN RANCHES—Two 20,000 acre ranches west of Saltillo, Coahuila State, about 150 miles from border. Good title, $3.50 per acre, suitable for cattle or recreation. Box L-895, The Oil and Gas Journal, Tulsa, Oklahoma.

### PRODUCTION WANTED

PRODUCING PROPERTIES: Highest price paid for producing properties, including stripper production. Tex-Gas-Oil Investment Co., Inc. 601 Meadows Building, Dallas, Texas, Phone: Em 3-1693.

### BUSINESS SERVICE

DELAWARE CORPORATIONS formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware.

### BUSINESS OPPORTUNITIES

FINANCIAL—Investment Banking Houses and Underwriters reached. Confidential. You can send the details of your proposition direct or thru your attorney to Consultant 817—51st Street, Brooklyn, N. Y.

NEW PRODUCTS WANTED—Well-established, responsible company with complete facilities for developing, manufacturing and marketing oil field equipment is seeking new or improved products, preferably patented or patentable to add to its presently well-known line. Royalty basis or outright purchase. Initial submission should identify product and general use without revealing engineering and confidential detail. Submissions will be handled promptly and confidentially. Box L-894, The Oil and Gas Journal, Tulsa, Oklahoma.

**FEDERAL OIL LEASES—UTAH**

You can benefit by our more than 25 years experience in your purchase of oil and gas leases on government land. All leases chosen for good geological location where major companies are active. Parcels of 80 acres or more. Terms as low as $40 down, $20 per month for 9 months. 30 day money back privilege. Good inflation hedge. Free maps. Complete details. Write now.

ATLAS OIL SURVEY
Dept. OGJ-8, Colorado Bldg.
Denver 2, Colorado

**The City Public Service Board of San Antonio, Texas**

**REQUESTS PROPOSALS TO FURNISH FULL REQUIREMENTS OF NATURAL GAS**

The gas is to meet requirements for distribution to customers through the City of San Antonio Gas Distribution System and for use in the steam-electric generating plants of the City Electric System, deliveries of gas to commence on or about April 1, 1962.

Estimates of annual requirements, load factor data, points of delivery and other pertinent data may be secured from:

**O. W. Sommers,**
**General Manager**
**Navarro and Villita Streets**
**P. O. Box 1771**
**San Antonio 6, Texas**


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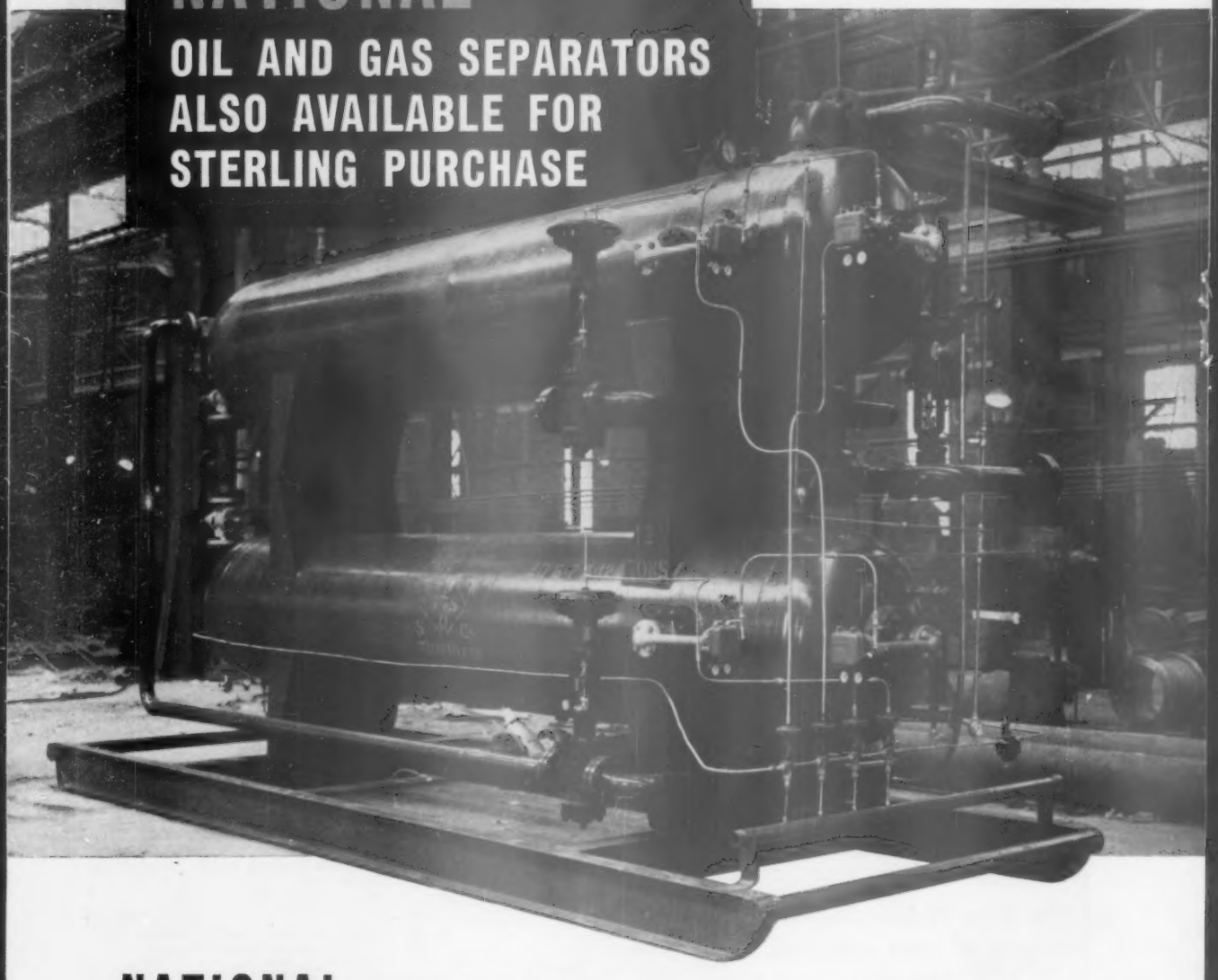

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